

EXHIBIT C

**(Plaintiff Headwater's Infringement
Contentions Chart for the '613 Patent)**

Exhibit D - U.S. Patent No. 9,215,613 (“’613 Patent”)

Accused Instrumentalities: smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by Verizon and all versions and variations thereof (“Accused Instrumentalities”) since the issuance of U.S. Pat. No. 9,215,613 (the “Asserted Patent”).

Claim 1

Claim	Public Documentation
[1pre] A wireless end-user device, comprising:	<p>The Accused Instrumentalities include “A wireless end-user device, comprising.”</p> <p>For example, Verizon sells and uses devices described by Verizon’s website below (e.g., devices made by Samsung, Apple, Motorola, Google, and Kyocera). These devices constitute a wireless end-user device as described in claim 1. <i>See, e.g.</i>: https://www.verizon.com/shop/online/5g-cell-phones/samsung/:</p>

Claim

Public Documentation

Shop Why Verizon Support Sign in Search

Have a phone you love? Get up to \$540 when you [bring your phone](#). OR get iPhone 14 Plus, on us. With Unlimited Plus plan. Online only. [Buy now](#)

Home / 5G Cell Phones Chat Video Call Call

5G Smartphones

All **Samsung** Apple Google Motorola Kyocera TCL

Samsung x Clear all 17 results

Filter

Brand (1)

- ☒ Samsung (17)
- ☐ Apple (9)
- ☐ Google (7)
- ☐ Motorola (6)
- ☐ Kyocera (2)

View results Clear all

Now \$10/mo.

Samsung Galaxy A54 5G

Starts at \$10.00/mo
~~\$19.99/mo~~ Details
for 36 months, 0% APR
Retail price: \$499.99

Samsung Galaxy S23 Ultra

Starts at \$33.33/mo
for 36 months, 0% APR
Retail price: \$1199.99

Samsung Galaxy S23+

Starts at \$27.77/mo
for 36 months, 0% APR
Retail price: \$999.99

See also e.g., <https://www.verizon.com/shop/online/5g-cell-phones/apple/>:

Claim

Public Documentation

Personal Business Stores Español

✓ Shop Why Verizon Support Sign in Search

Have a phone you love? Get up to \$540 when you [bring your phone](#). OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. [Shop now](#) [Offer Details](#)

Home / Smartphones / Apple Chat Video Call Call

Shop Apple smartphones

All Free phones Samsung **Apple** Motorola Google Kyocera

Lowest price with trade-in offer ☐ 30 results Sort by: Featured

Apple X Clear all

Filter

Brand (1) ^


☒ Apple (30)

OS v

Special Offers v


In Store Pickup v


Price v



Apple iPhone 15 Pro


Starts at \$27.77/mo for 36 months, 0% APR
Retail price: \$999.99

☐ Compare 




Apple iPhone 15 Pro Max

Starts at \$33.33/mo for 36 months, 0% APR
Retail price: \$1199.99

☐ Compare 

Titanium

iPhone 15 Pro



Get it on us. With any iPhone trade-in. Any model. Any condition. Guaranteed. With Unlimited Ultimate. [Details](#)

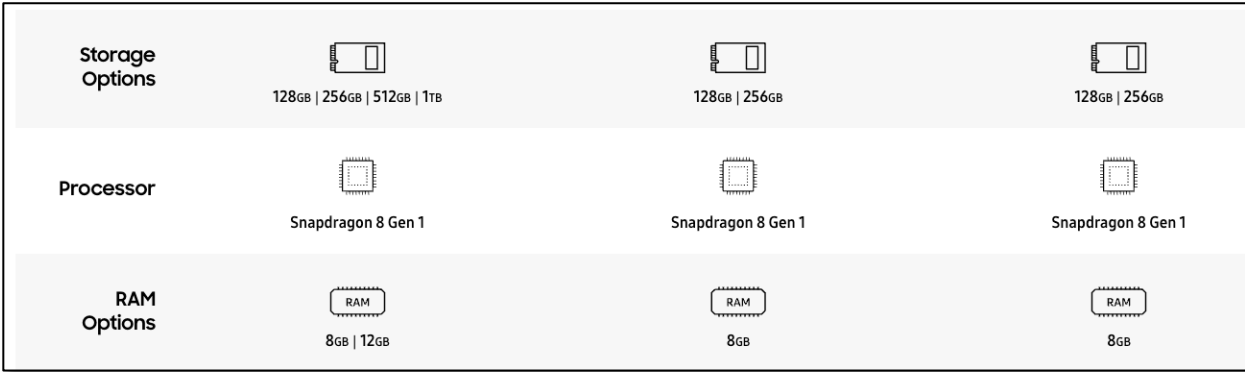
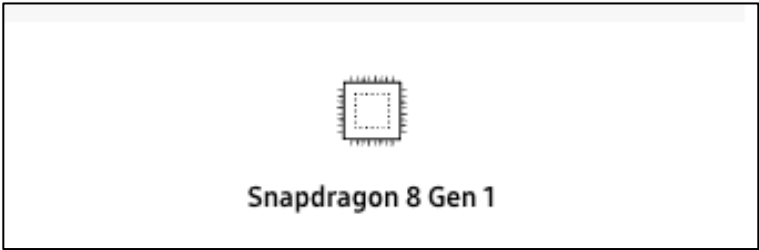
Buy >

Verizon sells smartphones on <https://www.verizon.com/smartphones>.

Verizon sells “basic” phones on <https://www.verizon.com/basic-phones>.

Verizon sells hotspot devices on <https://www.verizon.com/internet-devices>.

Verizon sells laptops and tablets on <https://www.verizon.com/tablets>.

Claim	Public Documentation
	<p>For further example, the Samsung Galaxy S22 model is sold or used by Verizon and includes 8GB RAM and either 128GB or 256GB non-removable memory storage, in which control policies for applications are stored. <i>See, e.g.,</i> https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:</p>  <p>The screenshot displays three columns of options for the Samsung Galaxy S22. The first column, labeled 'Storage Options', shows three choices: 128GB, 256GB, and 512GB, each with a corresponding storage icon. The second column, labeled 'Processor', shows three identical choices: Snapdragon 8 Gen 1, each with a corresponding processor icon. The third column, labeled 'RAM Options', shows three choices: 8GB, 12GB, and 8GB, each with a corresponding RAM icon.</p> <p>For further example, the Galaxy S22 has either a Snapdragon (in the United States) or Exynos (in Korea) architecture-based application processor. <i>See, e.g.,</i> https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:</p>  <p>The screenshot shows a single processor icon labeled 'Snapdragon 8 Gen 1'.</p> <p>For further example, the Apple iPhone 15 Pro model is sold or used by Verizon and includes 128GB, 256GB, 512GB, or 1TB of memory storage, in which control policies for applications are stored. <i>See, e.g.,</i> https://www.apple.com/iphone-15-pro/specs/:</p>

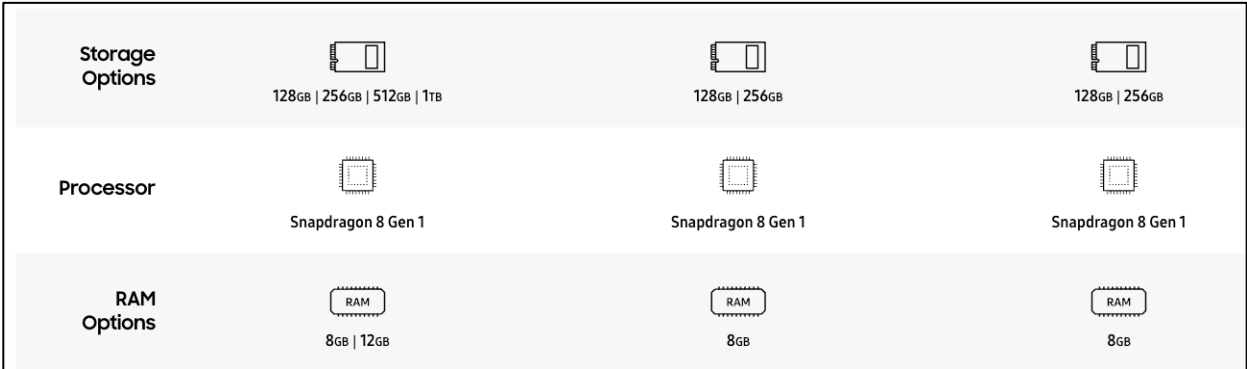
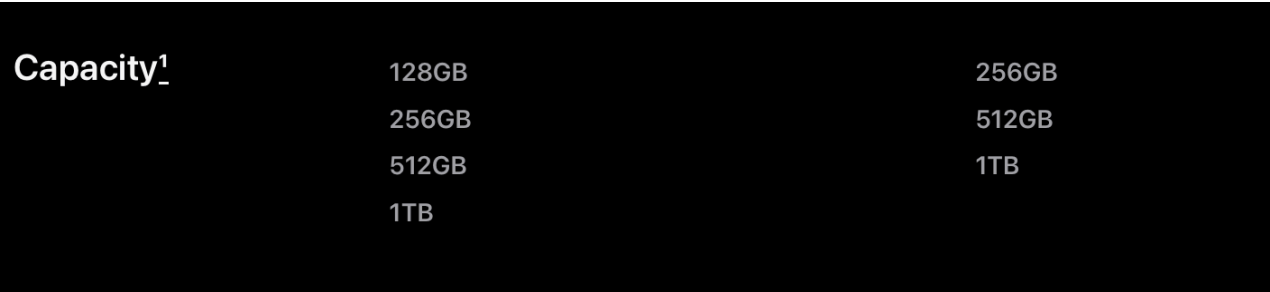
Claim	Public Documentation								
	<div data-bbox="590 240 1850 526"> <p>Capacity¹</p> <table> <tr> <td>128GB</td><td>256GB</td></tr> <tr> <td>256GB</td><td>512GB</td></tr> <tr> <td>512GB</td><td>1TB</td></tr> <tr> <td>1TB</td><td></td></tr> </table> </div> <p>For further example, the Apple iPhone 15 Pro model has a A17 Pro Chip. <i>See, e.g.,</i> https://www.apple.com/iphone-15-pro/specs/</p> <div data-bbox="590 634 1829 920"> <p>Chip</p> <div data-bbox="926 704 1094 867"> <p>A17 PRO</p> </div> <ul style="list-style-type: none"> A17 Pro chip New 6-core CPU with 2 performance and 4 efficiency cores New 6-core GPU New 16-core Neural Engine </div>	128GB	256GB	256GB	512GB	512GB	1TB	1TB	
128GB	256GB								
256GB	512GB								
512GB	1TB								
1TB									
<p>[1a] a wireless wide area network (WWAN) modem to communicate data for Internet service activities between the device and at least one WWAN, when configured for and connected to the WWAN;</p>	<p>The Accused Instrumentalities include “a wireless wide area network (WWAN) modem to communicate data for Internet service activities between the device and at least one WWAN, when configured for and connected to the WWAN.” This WWAN modem in the Accused Instrumentalities provides a connection to a Verizon’s wireless network.</p> <p>For example, Samsung Galaxy phones and tablets comprise a wireless modem for communicating with mobile service base stations. <i>See, e.g.,</i> https://www.samsung.com/us/smartphones/galaxy-s22/models/:</p>								





Claim	Public Documentation
	<div data-bbox="598 250 1608 1019" style="border: 1px solid black; padding: 10px;"> <p>Network & Connectivity</p> <p>5G</p> <p>5G Non-Standalone (NSA), Standalone (SA), Sub6 / mmWave</p> <p>LTE</p> <p>Enhanced 4x4 MIMO, Up to 7CA, LTE Cat.20</p> <p>Up to 2.0Gbps Download / Up to 200Mbps Upload</p> <p>Wi-Fi</p> <p>Wi-Fi 802.11 a/b/g/n/ac/ax 2.4G+5GHz+6GHz, HE160, MIMO, 1024-QAM</p> <p>Up to 2.4Gbps Download / Up to 2.4Gbps Upload</p> <p>Bluetooth</p> <p>Bluetooth® v 5.2, USB type-C, NFC, Location(GPS, Galileo, Glonass, BeiDou)</p> <p>Ultra Wide Band</p> <p>*Requires optimal connection. Actual speed may vary depending on country, carrier and user environment.</p> <p>*The bandwidths supported by the device may vary depending on the region or service provider.</p> <p>*Download and upload speeds reaching up to 2.4Gbps only available with Wi-Fi 6E. Wi-Fi 6E only supported on Galaxy S22 Ultra and S22+.</p> <p>Galaxy S22 has Wi-Fi 6.</p> <p>*Galileo and BeiDou coverage may be limited. BeiDou may not be available for certain countries.</p> </div> <p>For further example, the Apple iPhone 15 Pro model is sold or used by Verizon and comprise a wireless modem for communicating with mobile service base stations. <i>See, e.g.,</i> https://www.apple.com/iphone-15-pro/specs/:</p>

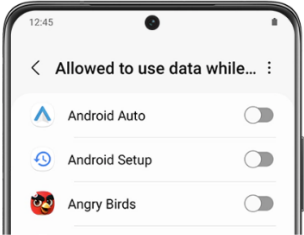
Claim	Public Documentation
	<div data-bbox="590 240 1738 1141"> <p>Cellular and Wireless</p> <p>Model A2848*</p> <p>5G NR (Bands n1, n2, n3, n5, n7, n8, n12, n14, n20, n25, n26, n28, n29, n30, n38, n40, n41, n48, n53, n66, n70, n71, n75, n76, n77, n78, n79)</p> <p>5G NR mmWave (Bands n258, n260, n261)</p> <p>FDD-LTE (Bands 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 20, 25, 26, 28, 29, 30, 32, 66, 71)</p> <p>TD-LTE (Bands 34, 38, 39, 40, 41, 42, 46, 48, 53)</p> <p>UMTS/HSPA+/DC-HSDPA (850, 900, 1700/2100, 1900, 2100 MHz)</p> <p>GSM/EDGE (850, 900, 1800, 1900 MHz)</p> <p>Model A2849*</p> <p>5G NR (Bands n1, n2, n3, n5, n7, n8, n12, n14, n20, n25, n26, n28, n29, n30, n38, n40, n41, n48, n53, n66, n70, n71, n75, n76, n77, n78, n79)</p> <p>5G NR mmWave (Bands n258, n260, n261)</p> <p>FDD-LTE (Bands 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 20, 25, 26, 28, 29, 30, 32, 66, 71)</p> <p>TD-LTE (Bands 34, 38, 39, 40, 41, 42, 46, 48, 53)</p> <p>UMTS/HSPA+/DC-HSDPA (850, 900, 1700/2100, 1900, 2100 MHz)</p> <p>GSM/EDGE (850, 900, 1800, 1900 MHz)</p> <p>All models</p> <p>5G (sub-6 GHz and mmWave) with 4x4 MIMO⁹</p> <p>Gigabit LTE with 4x4 MIMO and LAA⁹</p> <p>Wi-Fi 6E (802.11ax) with 2x2 MIMO¹⁰</p> <p>Bluetooth 5.3</p> <p>Second-generation Ultra Wideband chip¹¹</p> <p>Thread networking technology</p> <p>NFC with reader mode</p> <p>Express Cards with power reserve</p> </div>
<p>[1b] a wireless local area network (WLAN) modem to communicate data for Internet service activities between the device and at least one WLAN, when configured for and connected to the WLAN;</p>	<p>The Accused Instrumentalities include “a wireless local area network (WLAN) modem to communicate data for Internet service activities between the device and at least one WLAN, when configured for and connected to the WLAN.”</p> <p>For example, Samsung Galaxy phones and tablets comprise a wi-fi modem for communicating over a wi-fi networks. <i>See, e.g.,</i> https://www.samsung.com/us/smartphones/galaxy-s22/models/:</p>

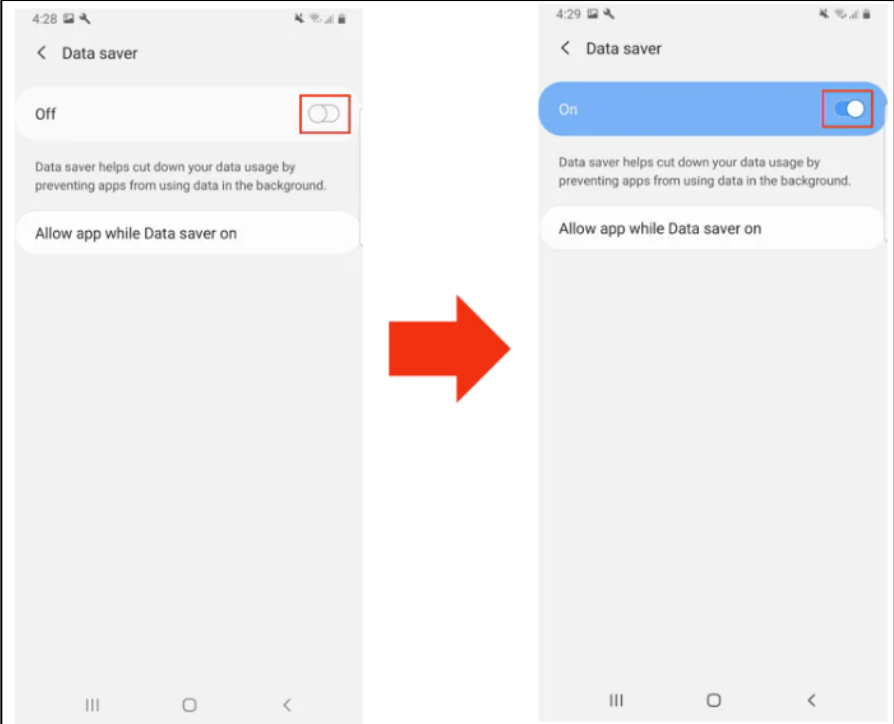
Claim	Public Documentation
	<div data-bbox="598 250 1608 1019" style="border: 1px solid black; padding: 10px;"> <p>Network & Connectivity</p> <p>5G 5G Non-Standalone (NSA), Standalone (SA), Sub6 / mmWave</p> <p>LTE Enhanced 4x4 MIMO, Up to 7CA, LTE Cat.20 Up to 2.0Gbps Download / Up to 200Mbps Upload</p> <p>Wi-Fi Wi-Fi 802.11 a/b/g/n/ac/ax 2.4G+5GHz+6GHz, HE160, MIMO, 1024-QAM Up to 2.4Gbps Download / Up to 2.4Gbps Upload</p> <p>Bluetooth Bluetooth® v 5.2, USB type-C, NFC, Location(GPS, Galileo, Glonass, BeiDou)</p> <p>Ultra Wide Band</p> <p><small>*Requires optimal connection. Actual speed may vary depending on country, carrier and user environment. *The bandwidths supported by the device may vary depending on the region or service provider. *Download and upload speeds reaching up to 2.4Gbps only available with Wi-Fi 6E. Wi-Fi 6E only supported on Galaxy S22 Ultra and S22+. Galaxy S22 has Wi-Fi 6. *Galileo and BeiDou coverage may be limited. BeiDou may not be available for certain countries.</small></p> </div> <p>For further example, the Apple iPhone 15 Pro model is sold or used by Verizon and comprises a wi-fi modem for communicating over a wi-fi networks. <i>See, e.g.,</i> https://www.apple.com/iphone-15-pro/specs/:</p>

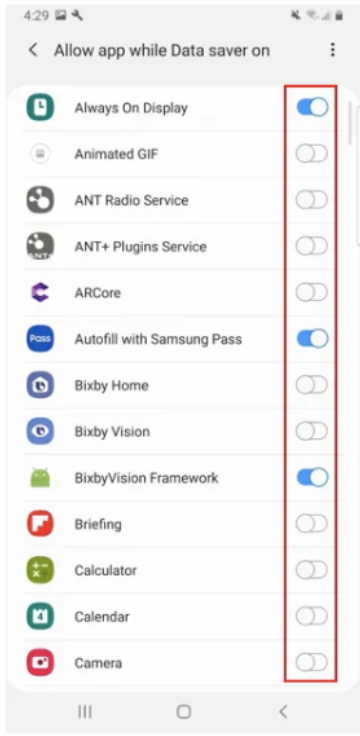
Claim	Public Documentation		
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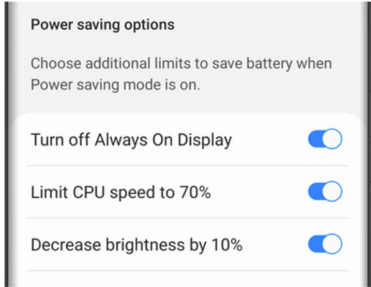
Claim	Public Documentation
[1c] a non-transient memory to store	<p>The Accused Instrumentalities include “a non-transient memory to store.”</p> <p>For example, the Galaxy S22 model is sold with 8GB RAM and either 128GB or 256GB non-removable memory storage, in which control policies for applications are stored. <i>See, e.g.,</i> https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:</p>  <p>The screenshot shows three columns of options for the Galaxy S22. The first column lists 'Storage Options' as 128GB 256GB 512GB 1TB. The second column lists 'Processor' as Snapdragon 8 Gen 1. The third column lists 'RAM Options' as 8GB 12GB.</p> <p>For further example, the Apple iPhone 15 Pro model is sold or used by Verizon and includes 128GB, 256GB, 512GB, or 1TB of memory storage, in which control policies for applications are stored. <i>See, e.g.,</i> https://www.apple.com/iphone-15-pro/specs/:</p>  <p>The screenshot shows a table of storage capacity options for the iPhone 15 Pro. The table has two columns: 'Capacity' and 'Options'. The options listed are 128GB, 256GB, 512GB, and 1TB.</p>


Claim	Public Documentation
<p>[1d] a differential traffic control policy list distinguishing between a first one or more applications resident on the device and a second one or more applications and/or services resident on the device, and</p>	<p>The Accused Instrumentalities comprise “a differential traffic control policy list distinguishing between a first one or more applications resident on the device and a second one or more applications and/or services resident on the device.”</p> <p>For example, Samsung’s “Data Saver,” or “Power Saver,” “Doze Mode,” “App Standby,” “Adaptive Battery,” and/or “JobScheduler” features include policies which distinguish between applications and/or services. <i>See, e.g.,</i> https://www.verizon.com/support/knowledge-base-236117/:</p> <div data-bbox="594 500 1644 1385" style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Samsung Galaxy S21 5G / Galaxy S21 Ultra 5G - Manage Data Usage</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>NOTE</p> <ul style="list-style-type: none"> • Data usage info provided by the device may differ from actual usage. For data usage info provided by Verizon, refer to the My Verizon website. •  For a better understanding of how data is used, check out this video. • To control data usage on your account, refer to Verizon Smart Family™. </div> <ol style="list-style-type: none"> 1. From a Home screen, swipe up from the center of the display to access the apps screen. → These instructions only apply to Standard mode and the default Home screen layout. 2. Navigate: Settings  Connections. 3. Tap Data usage then do any of the following: <ul style="list-style-type: none"> • Turn Data saver off <ol style="list-style-type: none"> a. Tap Data saver. b. Tap the Data saver switch to turn on  or off . → Data saver must be turned off to use Mobile Hotspot. </div> <p>; https://www.samsung.com/us/support/answer/ANS00079018/:</p>

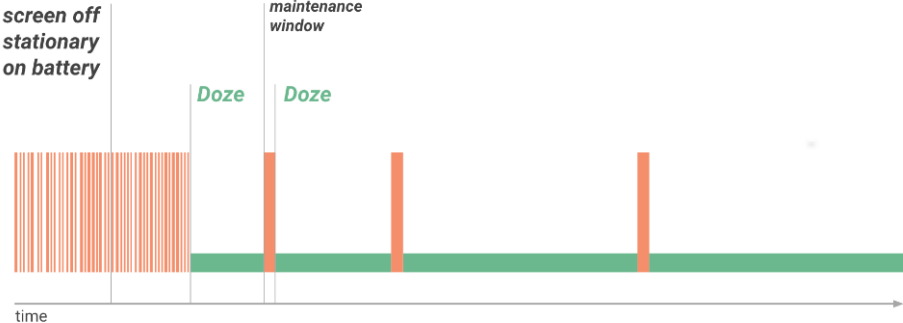
Claim	Public Documentation
	<div data-bbox="598 284 1602 792"><p>Turn Data saver on or off</p><p>Data saver prevents some apps from sending or receiving data in the background. So rest assured, you're not wasting any precious data.</p><ol style="list-style-type: none">1. Navigate to and open Settings, and then tap Connections.2. Tap Data usage, tap Data saver, and then tap the switch next to Turn on now.3. If there are still some apps you'd like to run in the background, you can set them as exceptions. Tap Allowed to use data while Data saver is on at the bottom of the screen.4. Tap More options (the three vertical dots) and choose Show system apps or Show allowed apps first to narrow down the list.5. Finally, tap the switch(es) next to your desired app(s).</div>  <p>; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/</p>

Claim	Public Documentation
	

Claim	Public Documentation
	<p data-bbox="598 256 1434 313">6 Toggle the switches on next to the apps that you need to receive notifications from all the time. Email, Messages, Messenger, Instagram and Facebook are all popular options to allow unrestricted data access..</p>  <p data-bbox="583 1076 1402 1117">; https://www.samsung.com/us/support/answer/ANS00078987/:</p>

Claim	Public Documentation
	<div data-bbox="594 245 1829 862"> <h3>Power saving mode ✓</h3> <p>Note: Using Power saving mode can affect app and device performance. Some tasks and features may take longer to complete or update. Additionally, apps running in the background may not receive updates or send you notifications when Power saving mode is enabled.</p> <p>Before you turn in for the night, change your phone's power mode. This will decrease your phone's performance and save battery life.</p> <ol style="list-style-type: none"> 1. Navigate to and open Settings, and then tap Battery and device care. 2. Tap Battery, and then tap Power saving. 3. Tap the switches next to your desired settings or customizations. 4. Finally, tap the switch at the top of the screen to activate Power saving mode. <p>You will not be able to adjust the settings once the mode is enabled. If you want to change any of the settings, you'll need to temporarily disable Power saving mode.</p>  <p>The screenshot shows a 'Power saving options' menu with three toggle switches, all of which are turned on. The options are: 'Turn off Always On Display', 'Limit CPU speed to 70%', and 'Decrease brightness by 10%'.</p> </div> <p>; https://developer.android.com/training/basics/network-ops/data-saver:</p> <div data-bbox="594 958 1619 1390"> <h3>Optimize network data usage 🔖</h3> <p>Over the life of a smartphone, the cost of a cellular data plan can easily exceed the cost of the device itself. On Android 7.0 (API level 24) and higher, users can enable Data Saver on a device-wide basis in order to optimize their device's data usage, and use less data. This ability is especially useful when roaming, near the end of the billing cycle, or for a small prepaid data pack.</p> <p>When a user enables Data Saver in Settings and the device is on a metered network, the system blocks background data usage and signals apps to use less data in the foreground wherever possible. Users can allow specific apps to use background metered data usage even when Data Saver is turned on.</p> <p>Android 7.0 (API level 24) extends the <code>ConnectivityManager</code> API to provide apps with a way to retrieve the user's Data Saver preferences and monitor preference changes. It is considered good practice for apps to check whether the user has enabled Data Saver and make an effort to limit foreground and background data usage.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1579 799"><h3>Check data saver preferences</h3><p>On Android 7.0 (API level 24) and higher, apps can use the <code>ConnectivityManager</code> API to determine what data usage restrictions are being applied. The <code>getRestrictBackgroundStatus()</code> method returns one of the following values:</p><p><code>RESTRICT_BACKGROUND_STATUS_DISABLED</code></p><p>Data Saver is disabled.</p><p><code>RESTRICT_BACKGROUND_STATUS_ENABLED</code></p><p>The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.</p><p><code>RESTRICT_BACKGROUND_STATUS_WHITELISTED</code></p><p>The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.</p><p>Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses <code>ConnectivityManager.isActiveNetworkMetered()</code> and <code>ConnectivityManager.getRestrictBackgroundStatus()</code> to determine how much data the app should use:</p></div> <p data-bbox="594 816 1593 849">; https://developer.android.com/training/monitoring-device-state/doze-standby;</p> <div data-bbox="594 857 1831 1356"><h2>Optimize for Doze and App Standby </h2><p>Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. <i>Doze</i> reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. <i>App Standby</i> defers background network activity for apps with which the user has not recently interacted.</p><p>While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.</p><p>Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.</p></div>

Claim	Public Documentation
	<div data-bbox="594 245 1545 870"> <h3>Understanding Doze</h3> <p>If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms.</p> <p>Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this <i>maintenance window</i>, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.</p>  <p>Figure 1. Doze provides a recurring maintenance window for apps to use the network and handle pending activities.</p> </div> <div data-bbox="594 894 1646 1065"> <p>At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger.</p> <p>As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity.</p> </div> <div data-bbox="594 1089 1831 1219"> <p>The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible.</p> </div> <p>; https://developer.android.com/topic/performance/appstandby:</p>

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

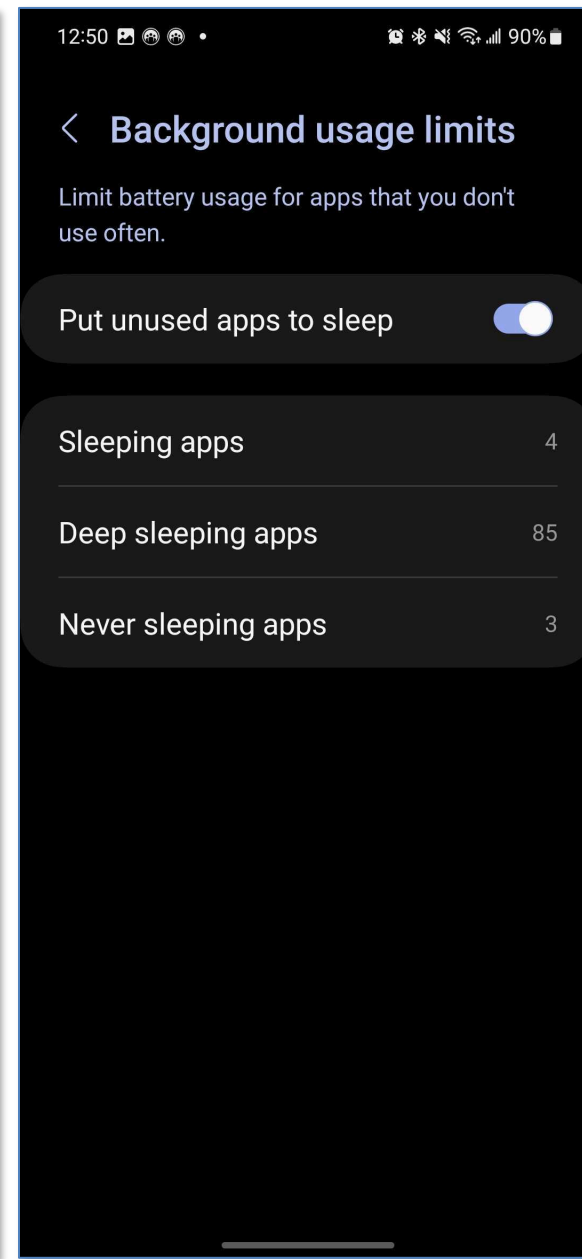
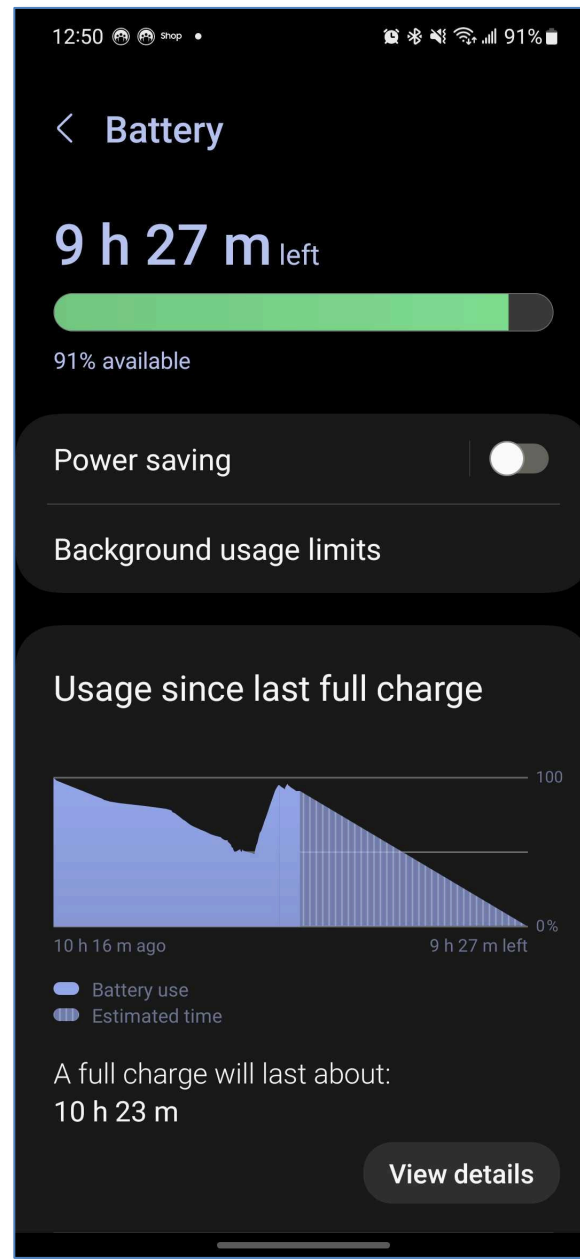
★ **Note:** Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

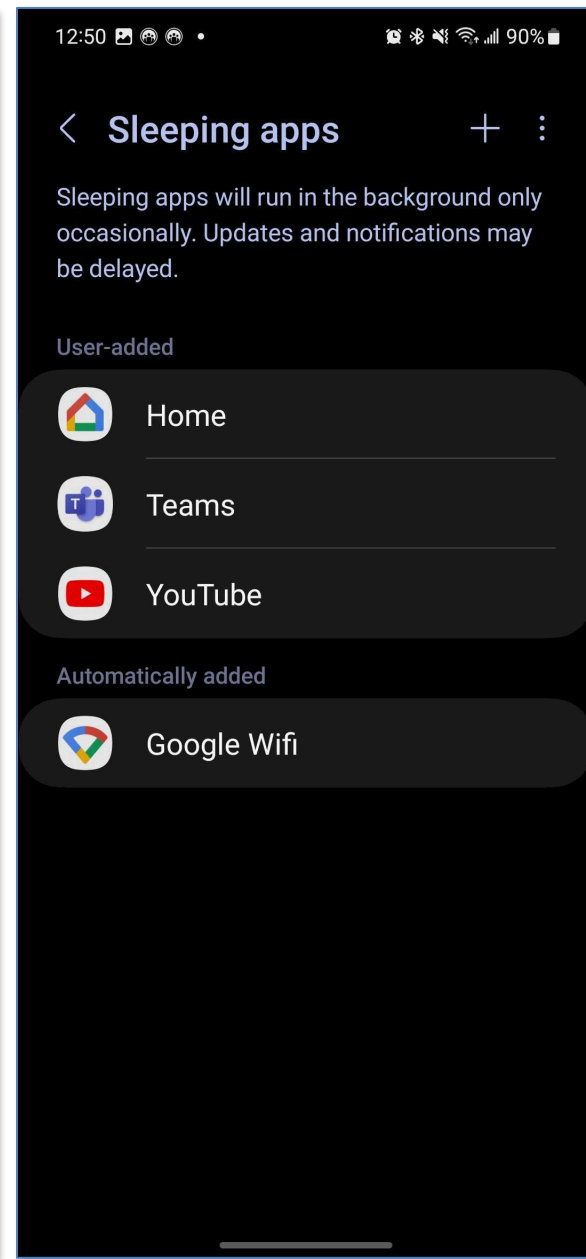
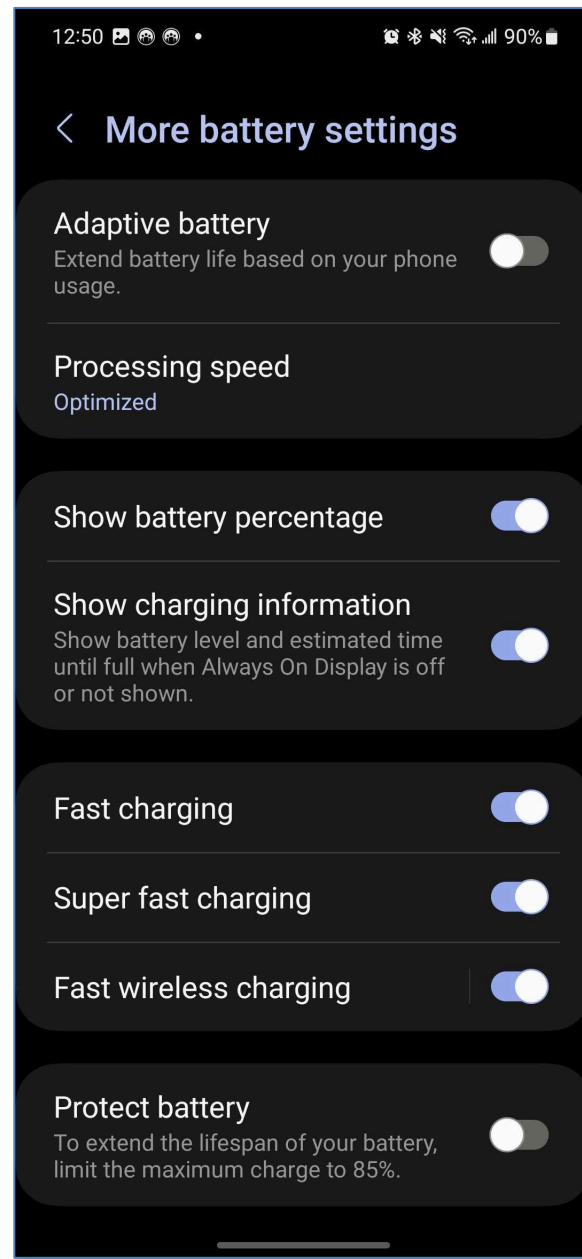
The buckets are:

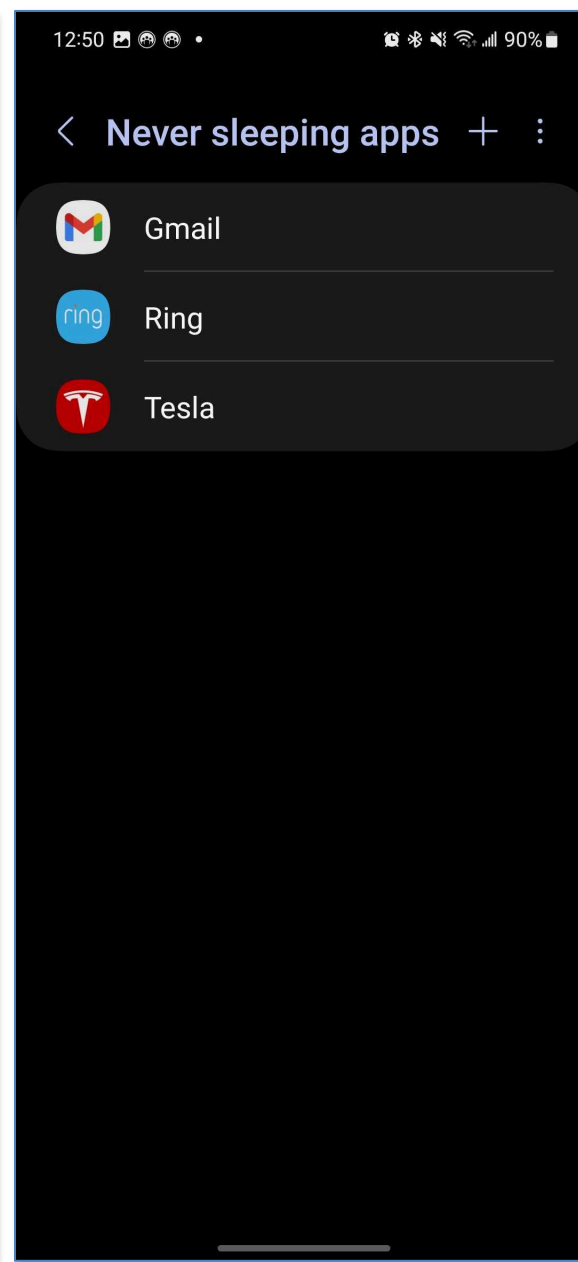
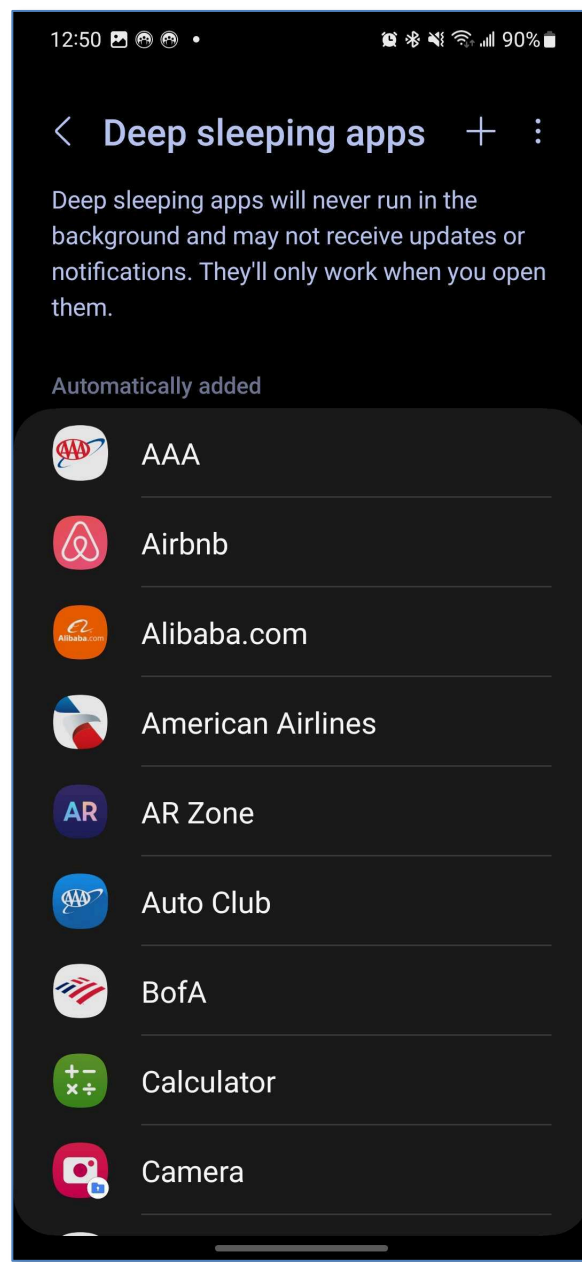
1. **Active:** App is currently being used or was very recently used.
2. **Working set:** App is in regular use.
3. **Frequent:** App is often used, but not every day.
4. **Rare:** App is not frequently used.
5. **Restricted:** App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.





Claim	Public Documentation
	<p>; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; https://developer.android.com/guide/components/activities/intro-activities; https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; <i>see also</i> the exemplary screenshots below:</p>

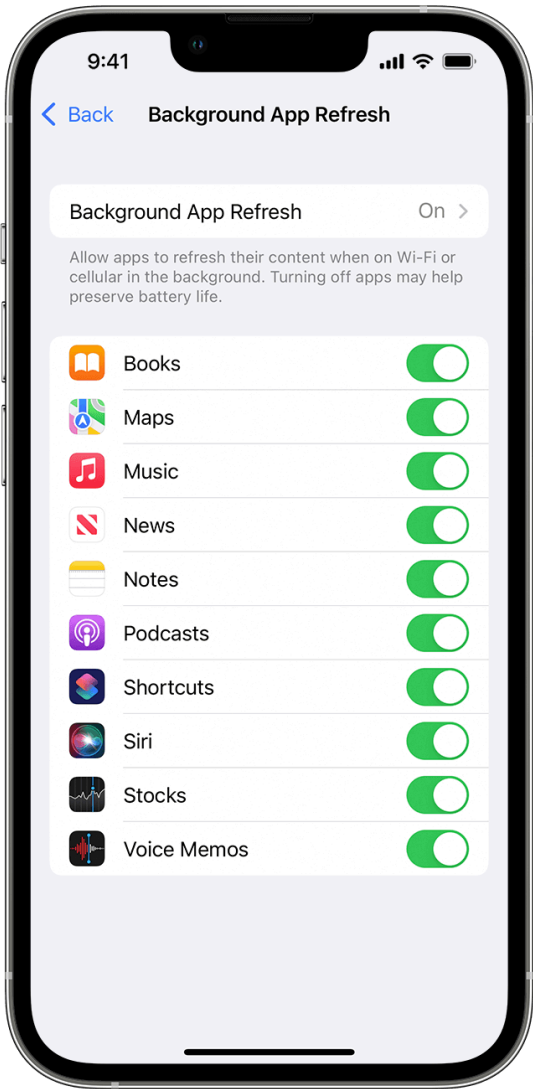






Claim	Public Documentation
	<p data-bbox="590 245 1373 277">; <i>see also</i> https://techshift.net/does-data-saver-apply-to-wi-fi/:</p> <p data-bbox="590 331 1037 363">“Does data saver apply to Wi-Fi?</p> <p data-bbox="590 417 1990 488">Does data saver affect WiFi? No, it doesn’t. Data saver only restricts the apps from using mobile data. While you are on WiFi, your phone’s data saver won’t affect it.”</p> <p data-bbox="590 526 1829 558">; https://www.technipages.com/how-to-give-android-apps-unrestricted-data-access-data-saver-on/:</p> <p data-bbox="590 596 1814 628">“The Data Saver option is only when you’re not on WiFi and affects how you see your content.”</p> <p data-bbox="590 665 1990 776">As another example, at least Apple’s “Background App Refresh” and “Low Power Mode” features include policies which distinguish between applications and/or services. <i>See, e.g.,</i> https://www.verizon.com/support/knowledge-base-207174/:</p>

Claim	Public Documentation
	<div><div><div><div>PersonalBusiness</div><div>StoresEspañol</div></div><div><div></div><div>ShopWhy VerizonSupport</div><div>Sign inSearch</div></div><div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div></div><div>Support > Apple > Apple iPhone 7 Plus</div><h2>Apple iPhone - Turn Background App Refresh On / Off</h2><div>NOTE<p>When Background App Refresh is turned on, apps that take advantage of this feature can refresh themselves in the background. For additional info, refer to multitasking and background app refresh.</p></div><ol style="list-style-type: none">From a Home screen on your Settings  > General. → If an app isn't available on your Home screen, swipe left to access the App Library.Tap Background App Refresh twice then tap one of the following: → When low power mode is on, the background app refresh is disabled.<ul style="list-style-type: none">OffWi-FiWi-Fi and Cellular Data<p>https://support.apple.com/en-us/HT202070:</p></div>

Claim	Public Documentation
	<div data-bbox="604 305 1297 360"><h2>Use Background App Refresh</h2></div> <div data-bbox="604 389 1377 636"><p>After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content.</p></div> <div data-bbox="604 672 1373 876"><p>If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again.</p></div> <div data-bbox="583 1377 1144 1409"><p>https://support.apple.com/en-us/HT205234:</p></div> <div data-bbox="1436 259 1965 1341"></div>

Use Low Power Mode to save battery life on your iPhone or iPad


Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

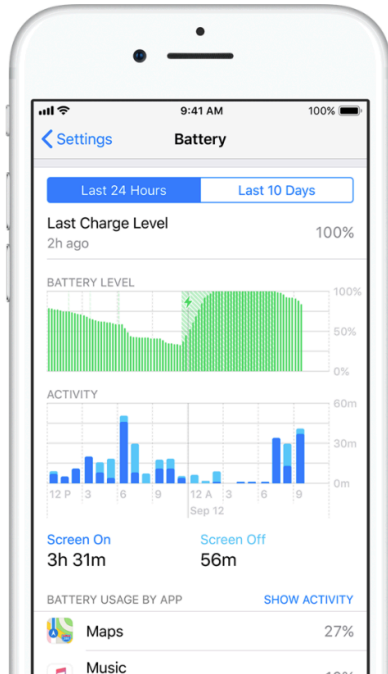
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models¹
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display²
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon  and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.










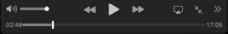

1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

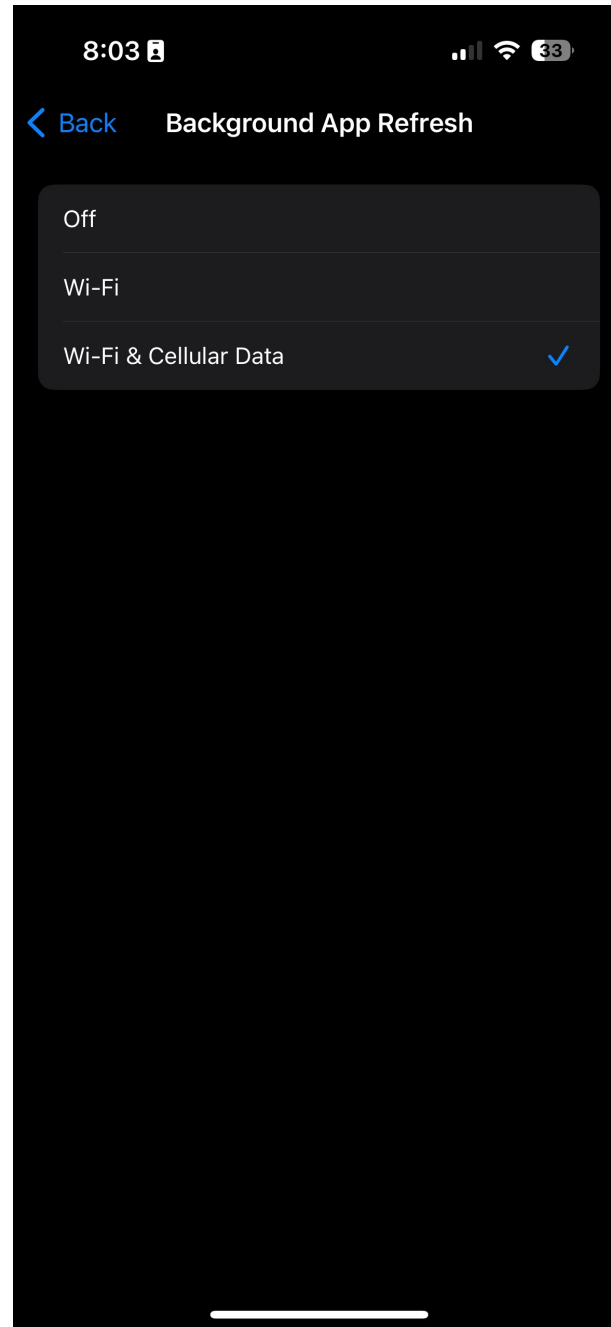
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	<p data-bbox="583 240 1350 272">https://www.apple.com/batteries/maximizing-performance/:</p> <h2 data-bbox="625 302 1396 358">View Battery Usage information</h2> <p data-bbox="625 375 1316 500">With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.</p> <p data-bbox="625 526 1293 583">Here are the messages you may see listed below the apps you've been using:</p> <p data-bbox="625 654 1293 743">Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.</p> <ul data-bbox="657 776 1316 1024" style="list-style-type: none"> <li data-bbox="657 776 1316 901">• To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. <li data-bbox="657 933 1283 1024">• If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  <p data-bbox="583 1068 1988 1357">; https://support.apple.com/en-us/HT213336; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-</p>





Claim	Public Documentation
	<p> ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks/bgappprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocesstask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/watchkit/background_execution; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/devicemanagement/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063/; </p>

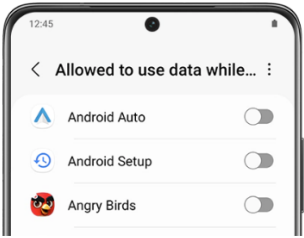
Claim	Public Documentation
	<div data-bbox="585 237 1820 933"><h3>Factors affecting your runtime</h3><div><div>Critically low battery</div><div>Background App Refresh switch</div><div>Airplane mode</div><div>Low Power Mode</div><div>Ongoing iCloud restore</div><div>Settings</div><div>Display on/off state</div><div>Device temperature</div><div>System budgets</div><div>Process contention</div><div>App usage</div><div>App switcher</div><div>Rate limiting</div><div>Camera in-use</div><div>Device lock state</div></div><div data-bbox="1089 885 1316 922"><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>02:1017:08</div></div></div>

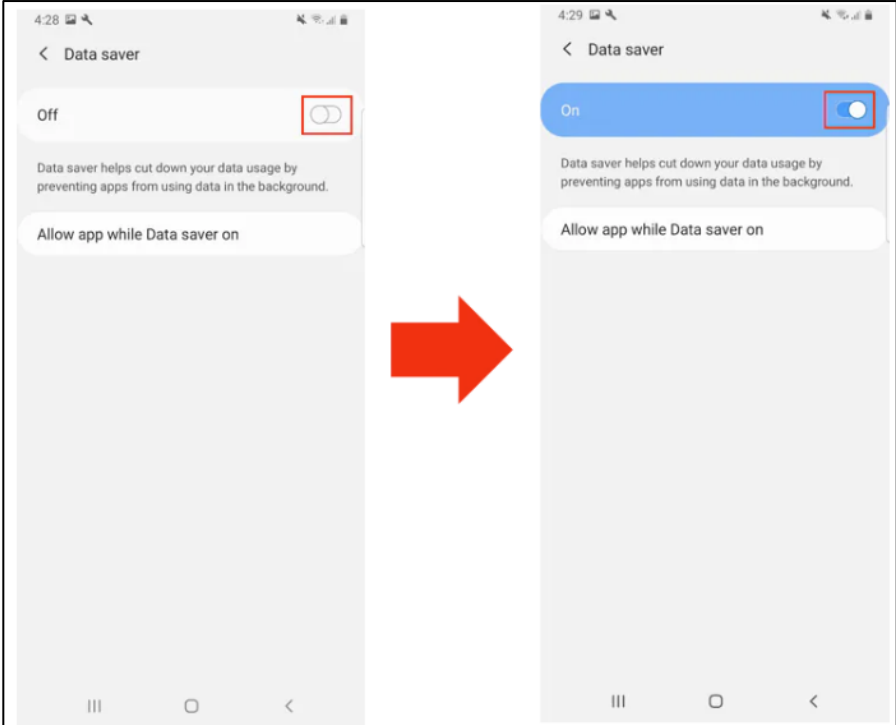
Claim	Public Documentation
	<div data-bbox="583 237 1822 935"><h3>Top factors</h3><ul style="list-style-type: none"> Critically low battery Low Power Mode App usage App switcher Background App Refresh switch System budgets Rate limiting</div> <p data-bbox="583 938 1108 979">; see also exemplary screen shots below:</p>

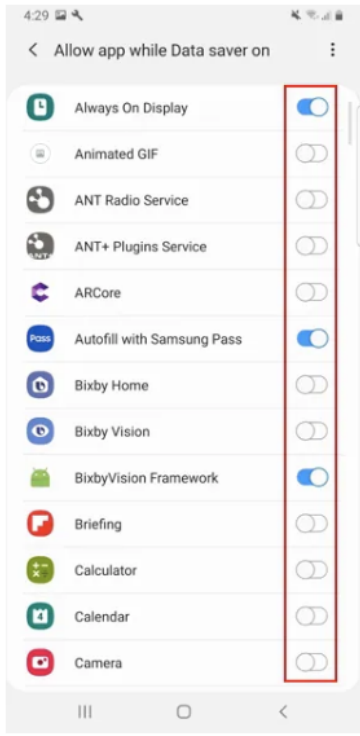


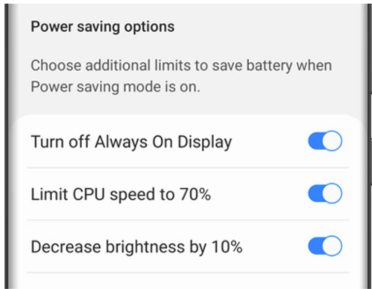
Claim	Public Documentation
	 <p>The image shows three Apple Watch screens side-by-side. The first screen is the 'Settings' menu, showing options for General, Do Not Disturb, and Airplane Mode. The second screen is the 'General' settings menu, showing options for Software Update, Orientation, Background App Refresh, and Wake Screen. The third screen is the 'Background App Refresh' settings menu, showing a toggle switch for 'Background App Refresh' which is currently turned off. Below the screens, there is a line of text: 'See also, e.g., https://www.verizon.com/plans/; https://www.verizon.com/business/products/plans/; https://www.verizon.com/plans/international/international-travel/; https://www.verizon.com/support/international-travel-faqs/.'</p>
<p>[1e] a differential traffic control policy applicable to at least some Internet service activities by or on behalf of the first one or more applications;</p>	<p>The Accused Instrumentalities comprises “a differential traffic control policy applicable to at least some Internet service activities by or on behalf of the first one or more applications.”</p> <p>For example, Samsung’s “Data Saver,” or “Power Saver,” “Doze Mode,” “App Standby,” “Adaptive Battery,” and/or “JobScheduler” features include policies which apply to at least some activities by or on behalf of applications and/or services. <i>See, e.g.,</i> https://www.verizon.com/support/knowledge-base-236117/:</p>


Claim	Public Documentation
	<div data-bbox="617 266 1566 380">Samsung Galaxy S21 5G / Galaxy S21 Ultra 5G - Manage Data Usage</div> <div data-bbox="653 467 722 493">NOTE</div> <div data-bbox="684 516 1520 688"><ul style="list-style-type: none">• Data usage info provided by the device may differ from actual usage. For data usage info provided by Verizon, refer to the My Verizon website.•  For a better understanding of how data is used, check out this video.• To control data usage on your account, refer to Verizon Smart Family™.</div> <div data-bbox="623 786 1461 1094"><ol style="list-style-type: none">1. From a Home screen, swipe up from the center of the display to access the apps screen. → These instructions only apply to Standard mode and the default Home screen layout.2. Navigate: Settings  > Connections.3. Tap Data usage then do any of the following:<ul style="list-style-type: none">• Turn Data saver off<ol style="list-style-type: none">a. Tap Data saver.b. Tap the Data saver switch to turn on  or off . → Data saver must be turned off to use Mobile Hotspot.</div> <div data-bbox="590 1143 1398 1179">; https://www.samsung.com/us/support/answer/ANS00079018/:</div>

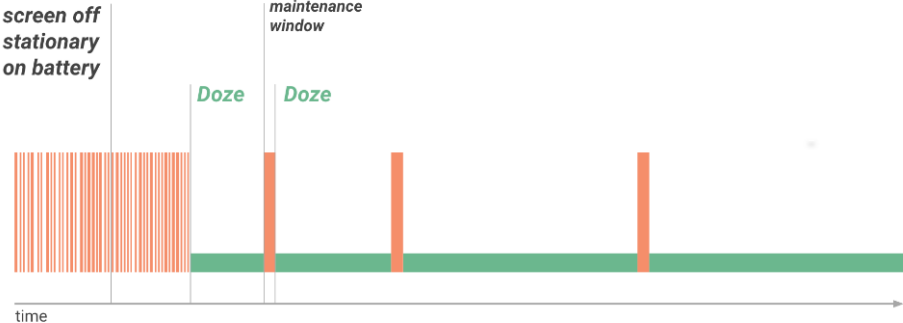
Claim	Public Documentation
	<div data-bbox="598 248 1602 756"><p>Turn Data saver on or off ✓</p><p>Data saver prevents some apps from sending or receiving data in the background. So rest assured, you're not wasting any precious data.</p><ol style="list-style-type: none">1. Navigate to and open Settings, and then tap Connections.2. Tap Data usage, tap Data saver, and then tap the switch next to Turn on now.3. If there are still some apps you'd like to run in the background, you can set them as exceptions. Tap Allowed to use data while Data saver is on at the bottom of the screen.4. Tap More options (the three vertical dots) and choose Show system apps or Show allowed apps first to narrow down the list.5. Finally, tap the switch(es) next to your desired app(s).</div> <p>; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/;</p>

Claim	Public Documentation
	

Claim	Public Documentation
	<p data-bbox="600 256 1432 311">6 Toggle the switches on next to the apps that you need to receive notifications from all the time. Email, Messages, Messenger, Instagram and Facebook are all popular options to allow unrestricted data access..</p>  <p data-bbox="583 1075 1402 1114">; https://www.samsung.com/us/support/answer/ANS00078987/:</p>

Claim	Public Documentation
	<div data-bbox="594 245 1831 862"> <h3>Power saving mode ✓</h3> <p>Note: Using Power saving mode can affect app and device performance. Some tasks and features may take longer to complete or update. Additionally, apps running in the background may not receive updates or send you notifications when Power saving mode is enabled.</p> <p>Before you turn in for the night, change your phone's power mode. This will decrease your phone's performance and save battery life.</p> <ol style="list-style-type: none"> 1. Navigate to and open Settings, and then tap Battery and device care. 2. Tap Battery, and then tap Power saving. 3. Tap the switches next to your desired settings or customizations. 4. Finally, tap the switch at the top of the screen to activate Power saving mode. <p>You will not be able to adjust the settings once the mode is enabled. If you want to change any of the settings, you'll need to temporarily disable Power saving mode.</p>  <p>The screenshot shows a 'Power saving options' menu with three toggle switches, all of which are turned on. The options are: 'Turn off Always On Display', 'Limit CPU speed to 70%', and 'Decrease brightness by 10%'.</p> </div> <p>; https://developer.android.com/training/basics/network-ops/data-saver:</p> <div data-bbox="594 956 1617 1390"> <h3>Optimize network data usage 🔖</h3> <p>Over the life of a smartphone, the cost of a cellular data plan can easily exceed the cost of the device itself. On Android 7.0 (API level 24) and higher, users can enable Data Saver on a device-wide basis in order to optimize their device's data usage, and use less data. This ability is especially useful when roaming, near the end of the billing cycle, or for a small prepaid data pack.</p> <p>When a user enables Data Saver in Settings and the device is on a metered network, the system blocks background data usage and signals apps to use less data in the foreground wherever possible. Users can allow specific apps to use background metered data usage even when Data Saver is turned on.</p> <p>Android 7.0 (API level 24) extends the <code>ConnectivityManager</code> API to provide apps with a way to retrieve the user's Data Saver preferences and monitor preference changes. It is considered good practice for apps to check whether the user has enabled Data Saver and make an effort to limit foreground and background data usage.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1577 797"> <h3>Check data saver preferences</h3> <p>On Android 7.0 (API level 24) and higher, apps can use the <code>ConnectivityManager</code> API to determine what data usage restrictions are being applied. The <code>getRestrictBackgroundStatus()</code> method returns one of the following values:</p> <p><code>RESTRICT_BACKGROUND_STATUS_DISABLED</code></p> <p>Data Saver is disabled.</p> <p><code>RESTRICT_BACKGROUND_STATUS_ENABLED</code></p> <p>The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.</p> <p><code>RESTRICT_BACKGROUND_STATUS_WHITELISTED</code></p> <p>The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.</p> <p>Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses <code>ConnectivityManager.isActiveNetworkMetered()</code> and <code>ConnectivityManager.getRestrictBackgroundStatus()</code> to determine how much data the app should use:</p> </div> <p data-bbox="594 889 1593 922">; https://developer.android.com/training/monitoring-device-state/doze-standby:</p> <div data-bbox="594 930 1829 1425"> <h2>Optimize for Doze and App Standby </h2> <p>Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. <i>Doze</i> reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. <i>App Standby</i> defers background network activity for apps with which the user has not recently interacted.</p> <p>While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.</p> <p>Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1545 870"> <h3>Understanding Doze</h3> <p>If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms.</p> <p>Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this <i>maintenance window</i>, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.</p>  <p>Figure 1. Doze provides a recurring maintenance window for apps to use the network and handle pending activities.</p> </div> <div data-bbox="594 894 1646 1065"> <p>At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger.</p> <p>As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity.</p> </div> <div data-bbox="594 1089 1831 1219"> <p>The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible.</p> </div> <p>; https://developer.android.com/topic/performance/appstandby:</p>

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

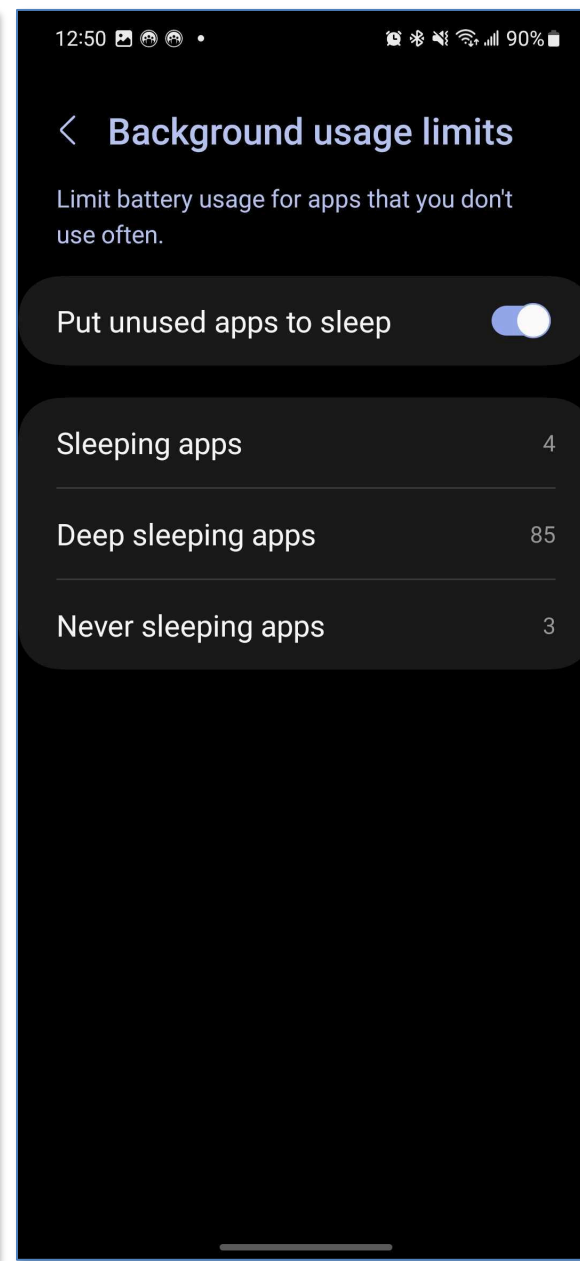
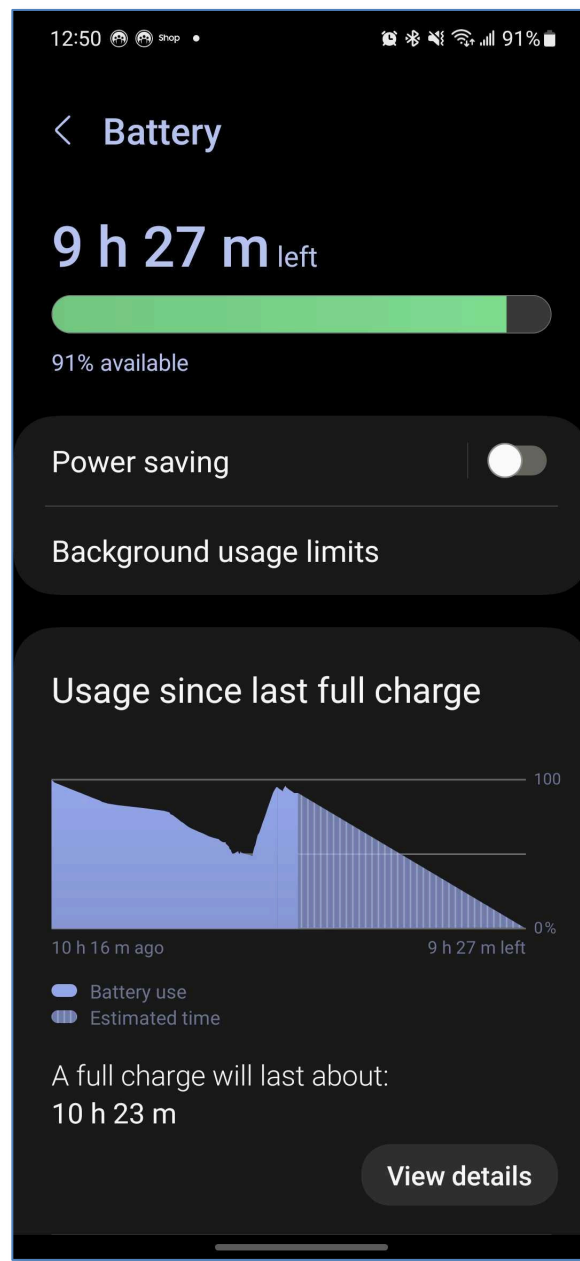
★ **Note:** Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling [`UsageStatsManager.getAppStandbyBucket\(\)`](#).

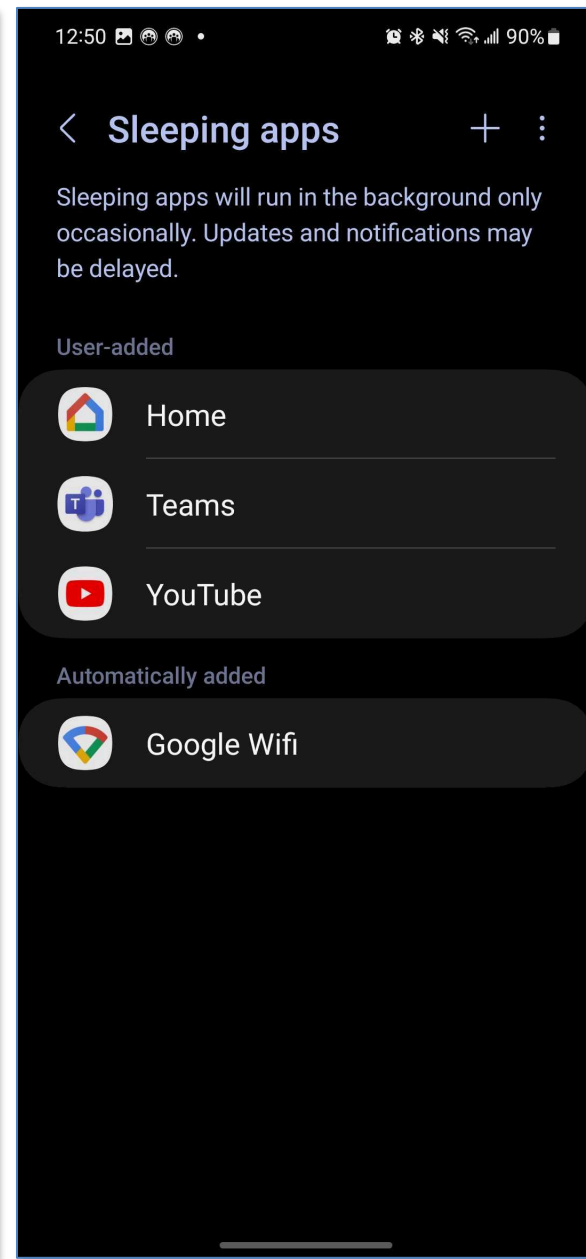
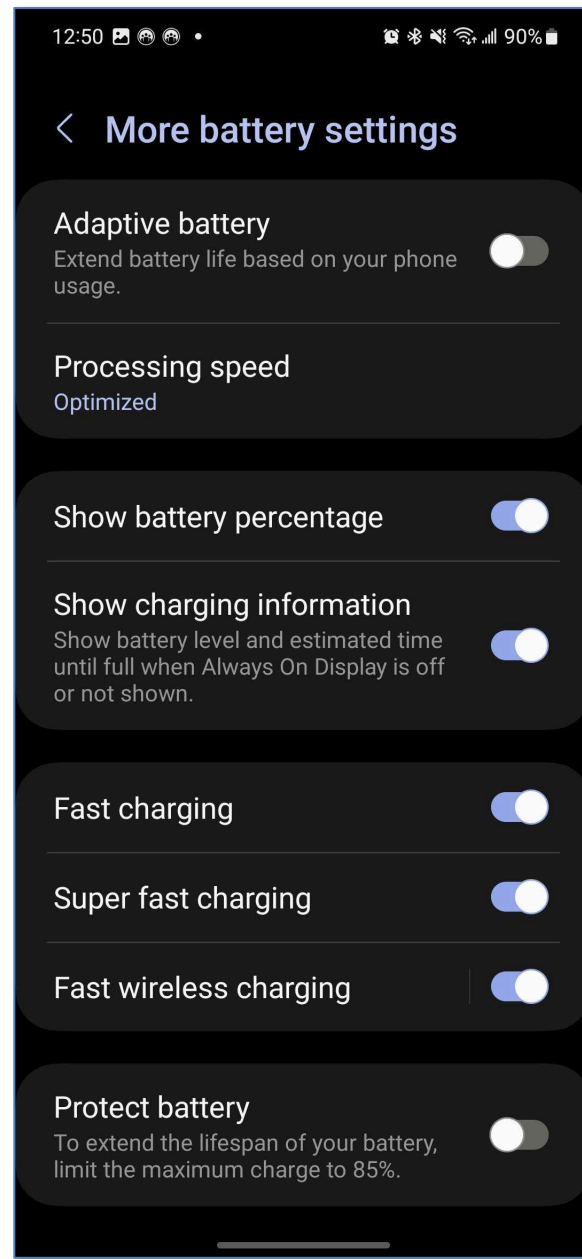
The buckets are:

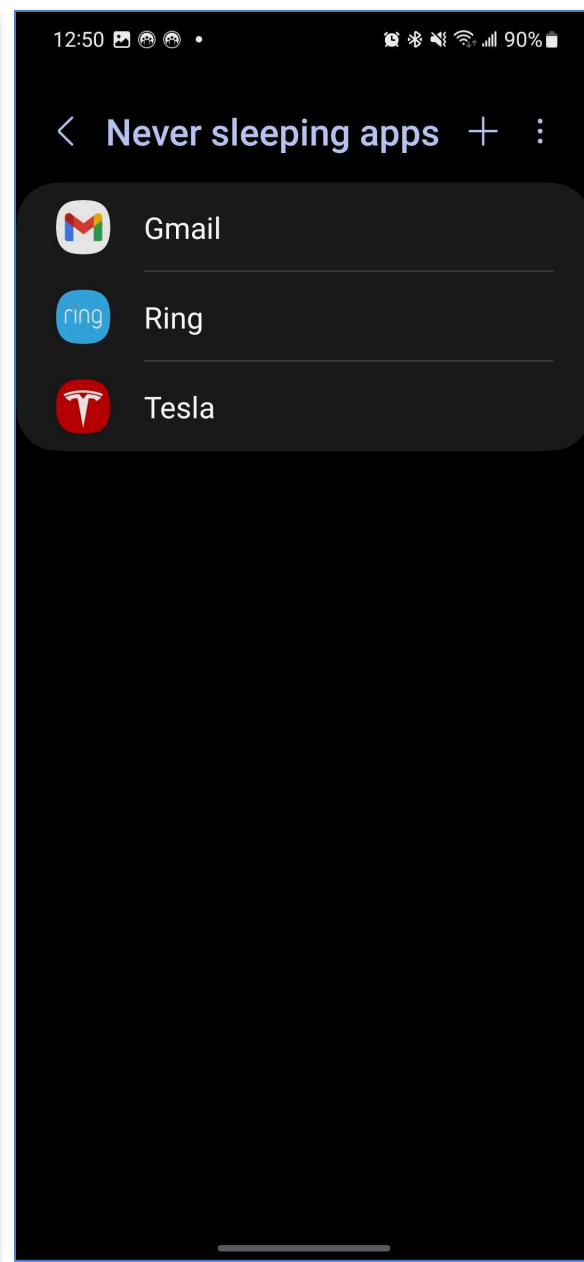
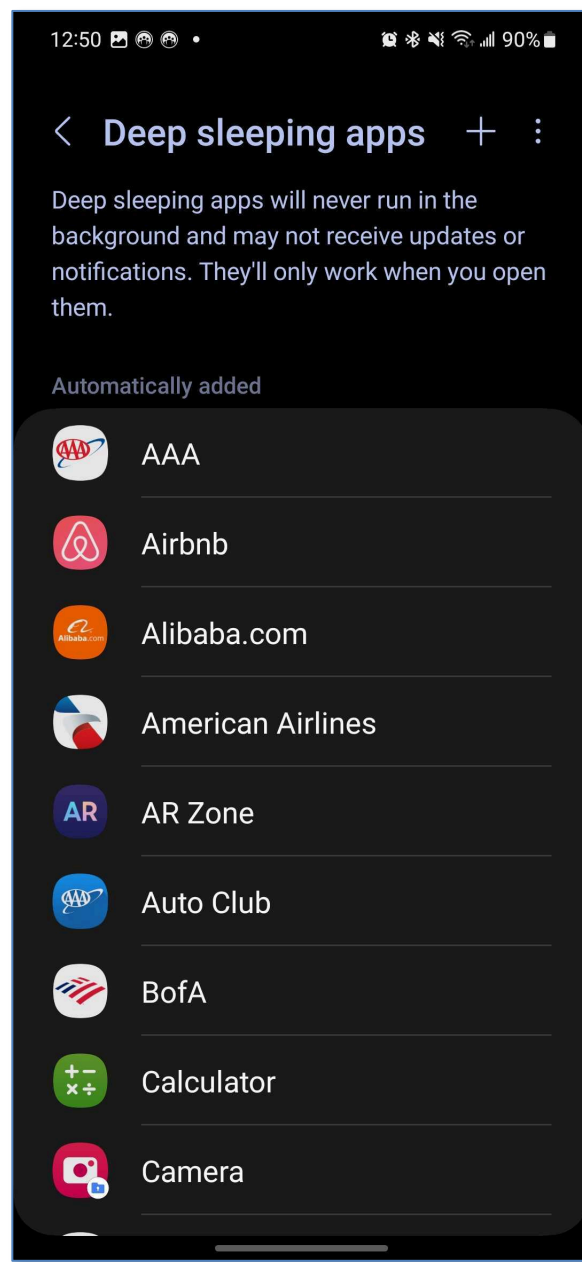
1. **Active:** App is currently being used or was very recently used.
2. **Working set:** App is in regular use.
3. **Frequent:** App is often used, but not every day.
4. **Rare:** App is not frequently used.
5. **Restricted:** App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.





Claim	Public Documentation
	<p>; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; https://developer.android.com/guide/components/activities/intro-activities; https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; <i>see also</i> the exemplary screenshots below:</p>

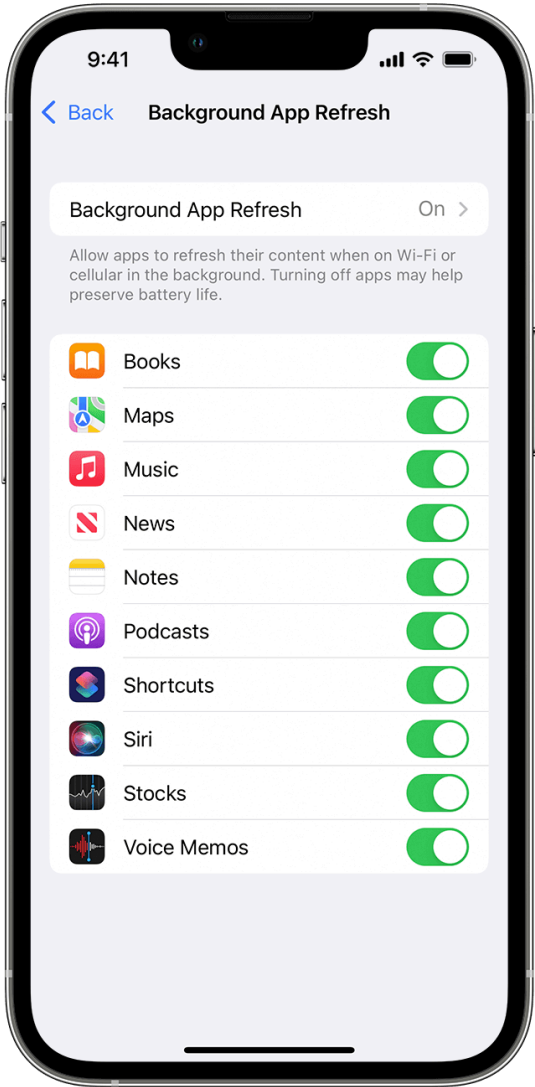






Claim	Public Documentation
	<p data-bbox="583 245 1373 277">; <i>see also</i> https://techshift.net/does-data-saver-apply-to-wi-fi/:</p> <p data-bbox="583 331 1037 363">“Does data saver apply to Wi-Fi?</p> <p data-bbox="583 417 1990 488">Does data saver affect WiFi? No, it doesn’t. Data saver only restricts the apps from using mobile data. While you are on WiFi, your phone’s data saver won’t affect it.”</p> <p data-bbox="583 526 1829 558">; https://www.technipages.com/how-to-give-android-apps-unrestricted-data-access-data-saver-on/:</p> <p data-bbox="583 596 1814 628">“The Data Saver option is only when you’re not on WiFi and affects how you see your content.”</p> <p data-bbox="583 665 1990 776">As another example, at least Apple’s “Background App Refresh” and “Low Power Mode” features include policies which apply to at least some activities by or on behalf of applications and/or services. <i>See, e.g.,</i> https://www.verizon.com/support/knowledge-base-207174/:</p>

Claim	Public Documentation
	<div><div><div><div>Personal Business</div><div>Stores Español</div></div><div><div></div><div>Shop Why Verizon Support</div><div>Sign in  Search </div></div><div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div></div><div>Support > Apple > Apple iPhone 7 Plus</div><div><h2>Apple iPhone - Turn Background App Refresh On / Off</h2></div><div><div>NOTE<p>When Background App Refresh is turned on, apps that take advantage of this feature can refresh themselves in the background. For additional info, refer to multitasking and background app refresh.</p></div></div><div><ol style="list-style-type: none">From a Home screen on your Settings  General. → If an app isn't available on your Home screen, swipe left to access the App Library.Tap Background App Refresh twice then tap one of the following: → When low power mode is on, the background app refresh is disabled.<ul style="list-style-type: none">OffWi-FiWi-Fi and Cellular Data</div><div>https://support.apple.com/en-us/HT202070:</div></div>

Claim	Public Documentation
	<div data-bbox="604 305 1297 362"><h2>Use Background App Refresh</h2></div> <div data-bbox="604 391 1377 638"><p>After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content.</p></div> <div data-bbox="604 670 1373 878"><p>If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again.</p></div> <div data-bbox="583 1377 1146 1411"><p>https://support.apple.com/en-us/HT205234:</p></div> <div data-bbox="1436 261 1967 1341"></div>

Use Low Power Mode to save battery life on your iPhone or iPad


Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

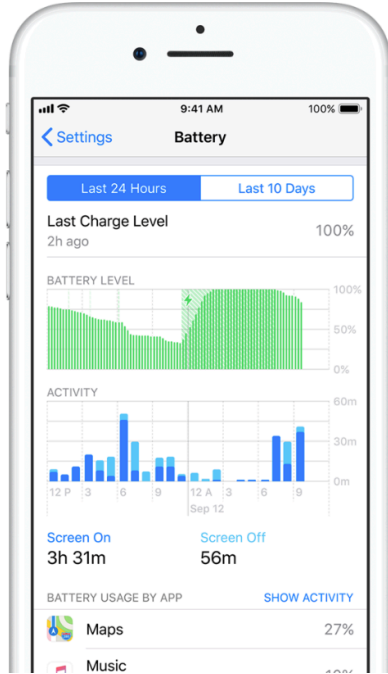
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models¹
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display²
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon  and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

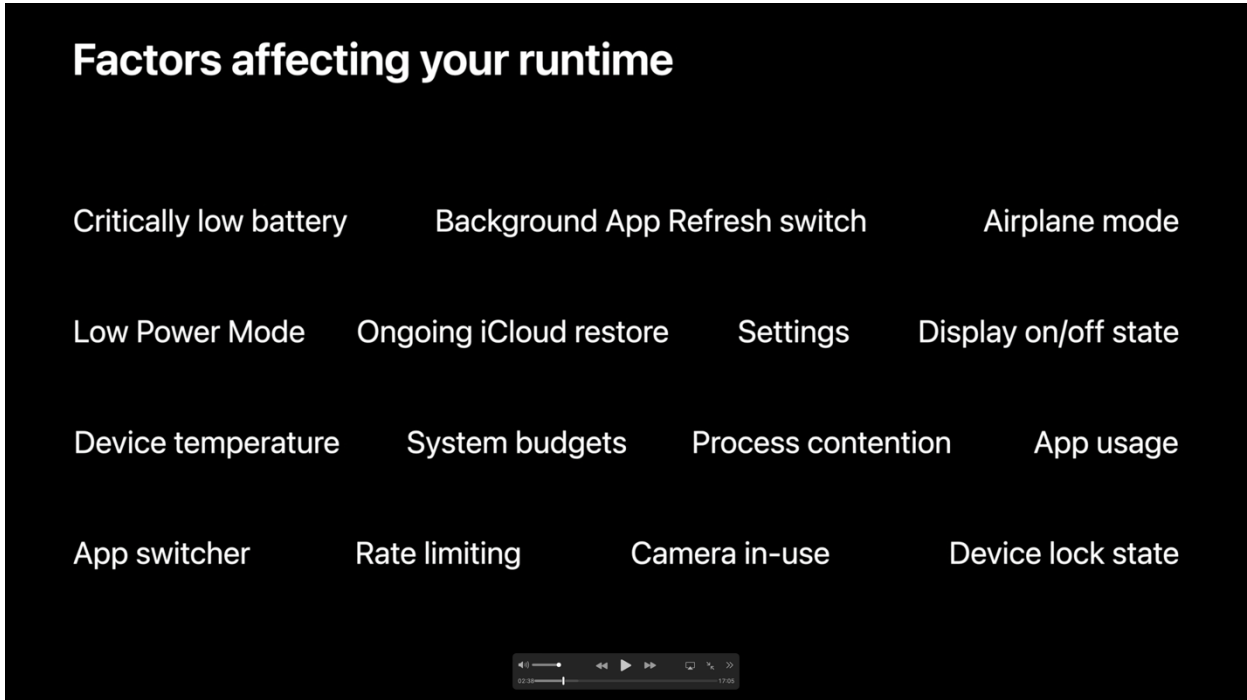









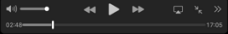

1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

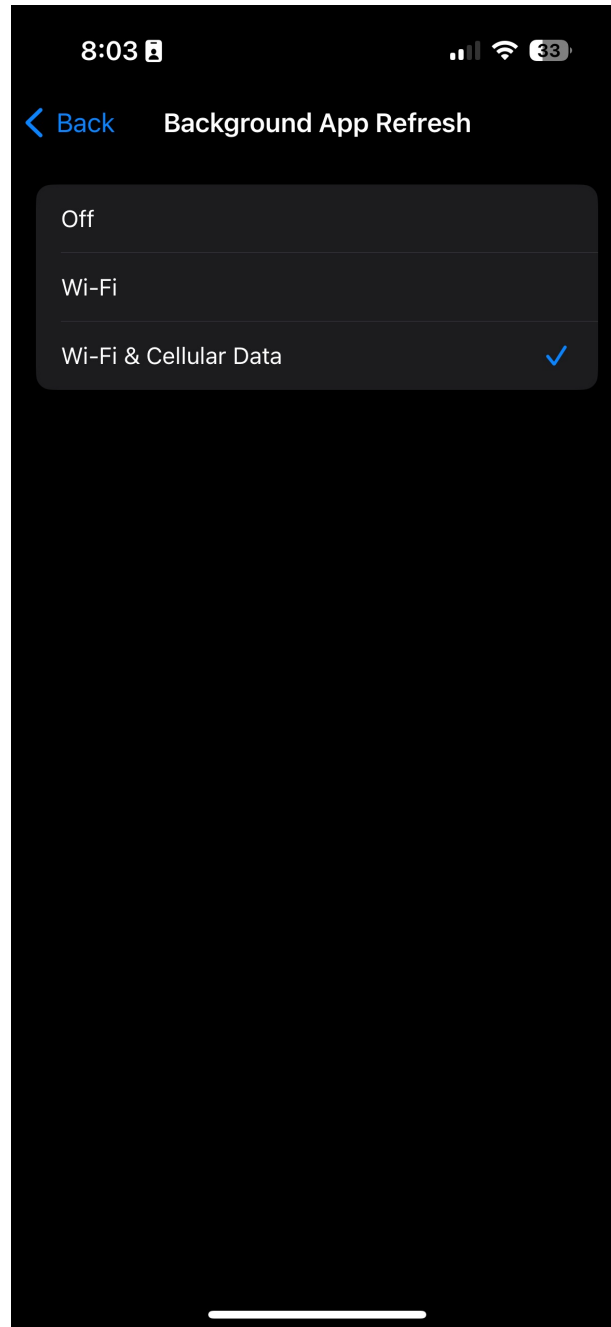
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.


Claim	Public Documentation
	<p data-bbox="583 240 1352 272">https://www.apple.com/batteries/maximizing-performance/:</p> <h2 data-bbox="625 302 1396 358">View Battery Usage information</h2> <p data-bbox="625 375 1316 500">With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.</p> <p data-bbox="625 526 1293 583">Here are the messages you may see listed below the apps you've been using:</p> <p data-bbox="625 654 1293 745">Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.</p> <ul data-bbox="655 777 1316 1024" style="list-style-type: none"> <li data-bbox="655 777 1316 902">• To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. <li data-bbox="655 932 1283 1024">• If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  <p data-bbox="583 1070 1988 1357">; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-</p>





Claim	Public Documentation
	<p> ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks/bgappprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocesstask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/devicemanagement/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063/; </p>

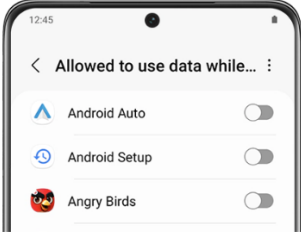
Claim	Public Documentation
	 <p>Factors affecting your runtime</p> <p>Critically low battery Background App Refresh switch Airplane mode</p> <p>Low Power Mode Ongoing iCloud restore Settings Display on/off state</p> <p>Device temperature System budgets Process contention App usage</p> <p>App switcher Rate limiting Camera in-use Device lock state</p> <p>02:08 / 17:08</p>

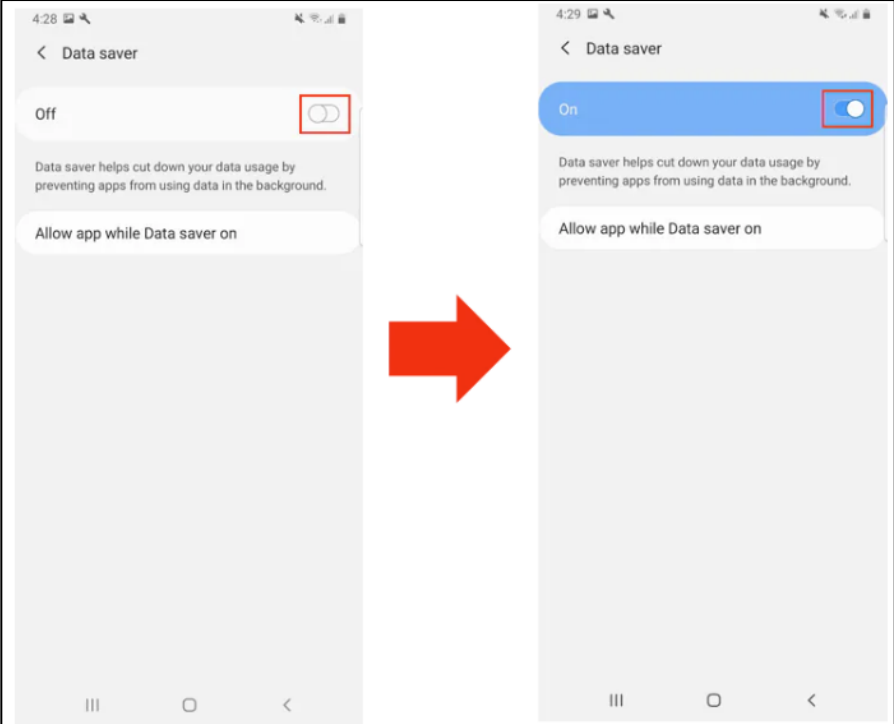
Claim	Public Documentation
	<div data-bbox="585 238 1822 933"><h3>Top factors</h3><ul style="list-style-type: none"> Critically low battery Low Power Mode App usage App switcher Background App Refresh switch System budgets Rate limiting</div> <p data-bbox="585 938 1106 971">; see also exemplary screen shots below:</p>

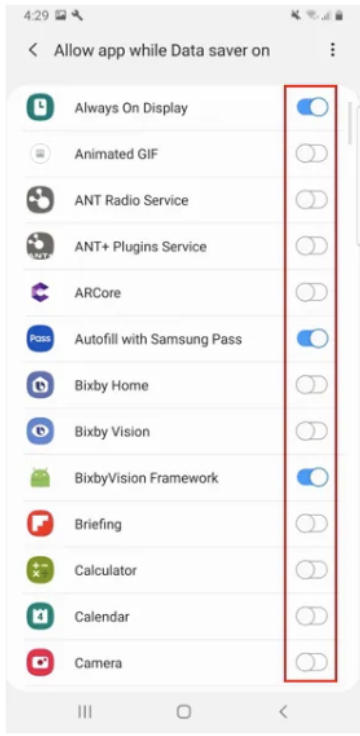


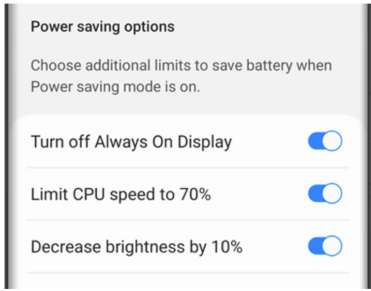
Claim	Public Documentation
	 <p>The image shows three Apple Watch screens side-by-side. The first screen is the 'Settings' menu with options for General, Do Not Disturb, and Airplane Mode. The second screen is the 'General' settings page with options for Software Update, Orientation, Background App Refresh, and Wake Screen. The third screen is the 'Background App Refresh' settings page, showing a toggle switch for 'Background App Refresh' which is currently turned off. Below the screens, there is a line of text: 'See also, e.g., https://www.verizon.com/plans/; https://www.verizon.com/business/products/plans/; https://www.verizon.com/plans/international/international-travel/; https://www.verizon.com/support/international-travel-faqs/.'</p>
<p>[1f] an interface to allow a user to augment the differential traffic control policy for the first one or more applications but not for the second one or more applications and/or services; and</p>	<p>The Accused Instrumentalities include “an interface to allow a user to augment the differential traffic control policy for the first one or more applications but not for the second one or more applications and/or services.”</p> <p>For example, devices sold or used by Verizon include an interface which allow users to augment policies and settings for some applications and/or services, but not all applications and/or services (e.g., system services). See, e.g., https://www.verizon.com/support/knowledge-base-236117/:</p>

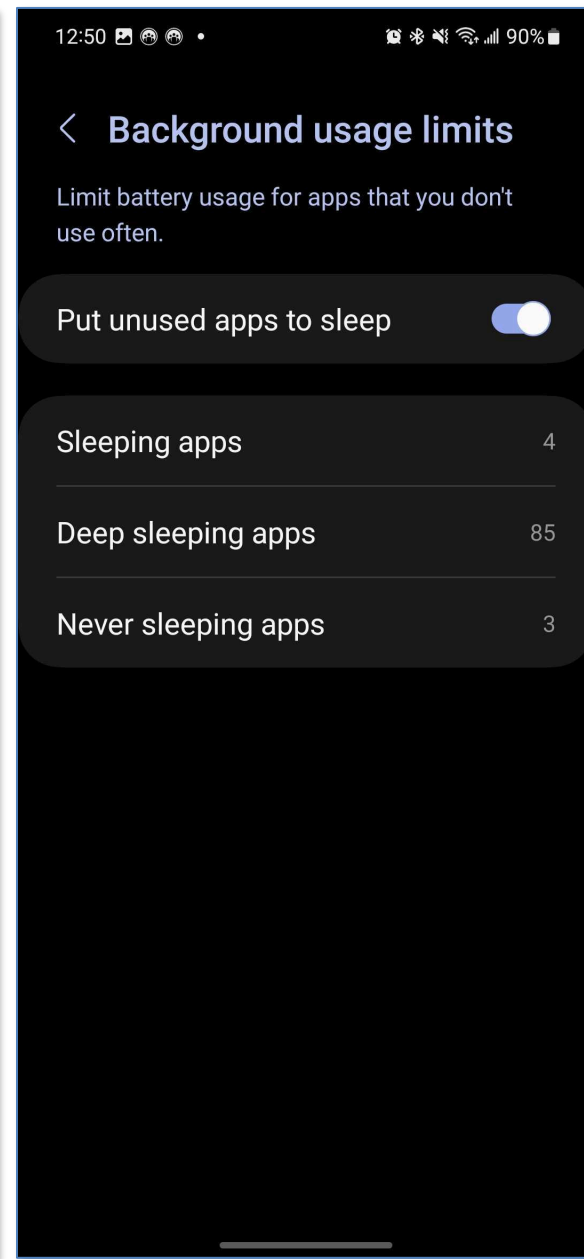
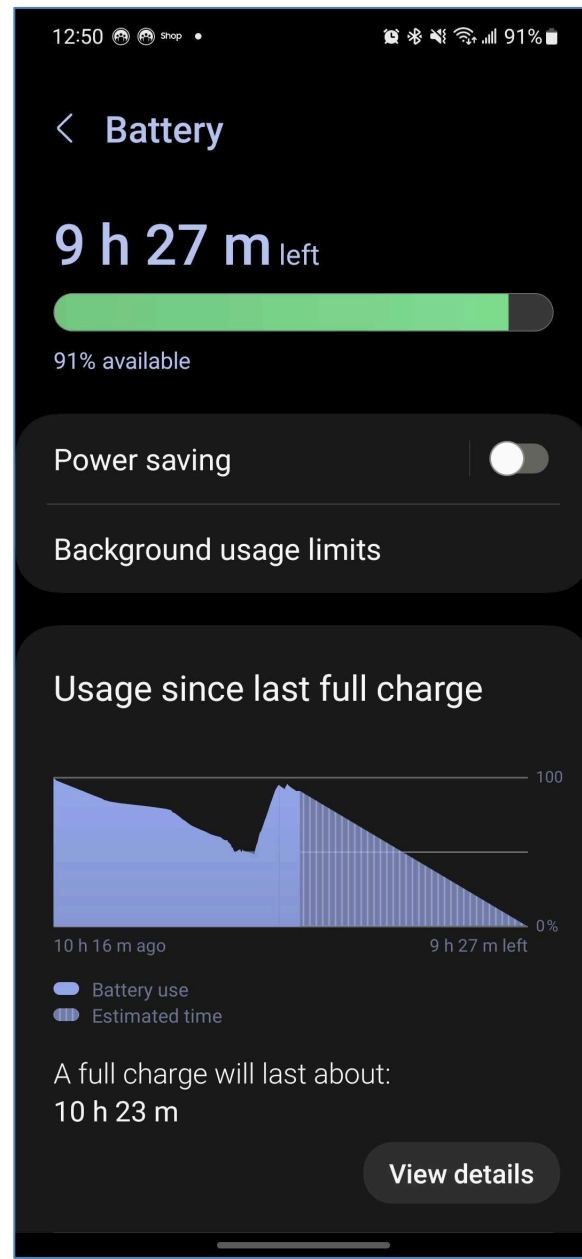
Claim	Public Documentation
	<div data-bbox="617 266 1566 380">Samsung Galaxy S21 5G / Galaxy S21 Ultra 5G - Manage Data Usage</div> <div data-bbox="653 467 722 493">NOTE</div> <div data-bbox="684 516 1520 688"><ul style="list-style-type: none">• Data usage info provided by the device may differ from actual usage. For data usage info provided by Verizon, refer to the My Verizon website.•  For a better understanding of how data is used, check out this video.• To control data usage on your account, refer to Verizon Smart Family™.</div> <div data-bbox="623 786 1457 1094"><ol style="list-style-type: none">1. From a Home screen, swipe up from the center of the display to access the apps screen. → These instructions only apply to Standard mode and the default Home screen layout.2. Navigate: Settings  > Connections.3. Tap Data usage then do any of the following:<ul style="list-style-type: none">• Turn Data saver off<ol style="list-style-type: none">a. Tap Data saver.b. Tap the Data saver switch to turn on  or off  . → Data saver must be turned off to use Mobile Hotspot.</div> <div data-bbox="590 1143 1398 1182">; https://www.samsung.com/us/support/answer/ANS00079018/:</div>

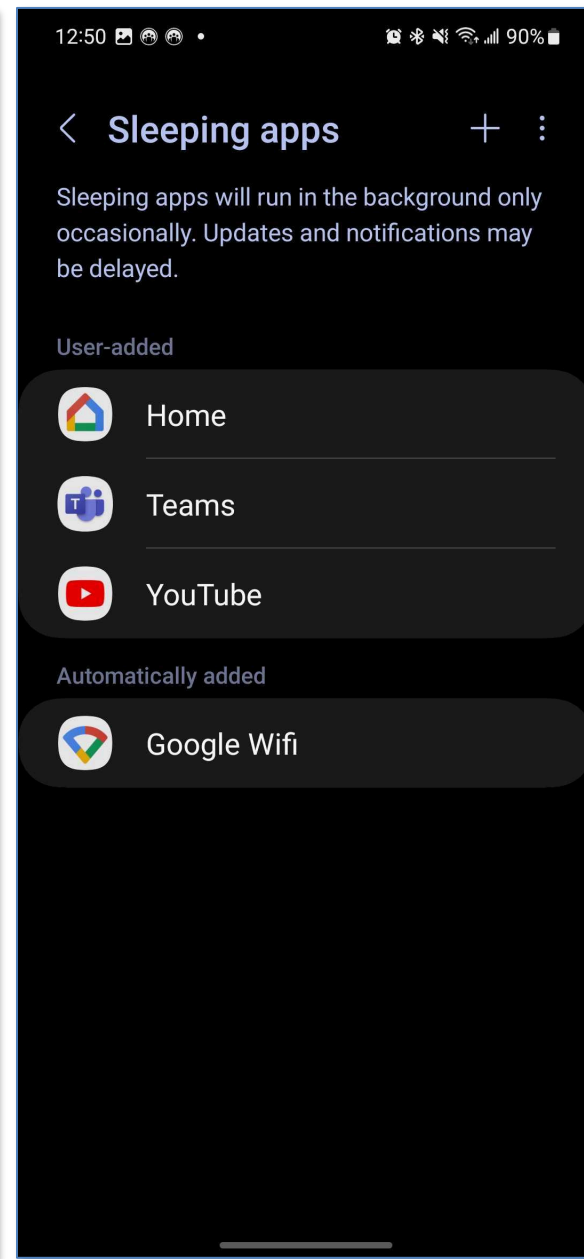
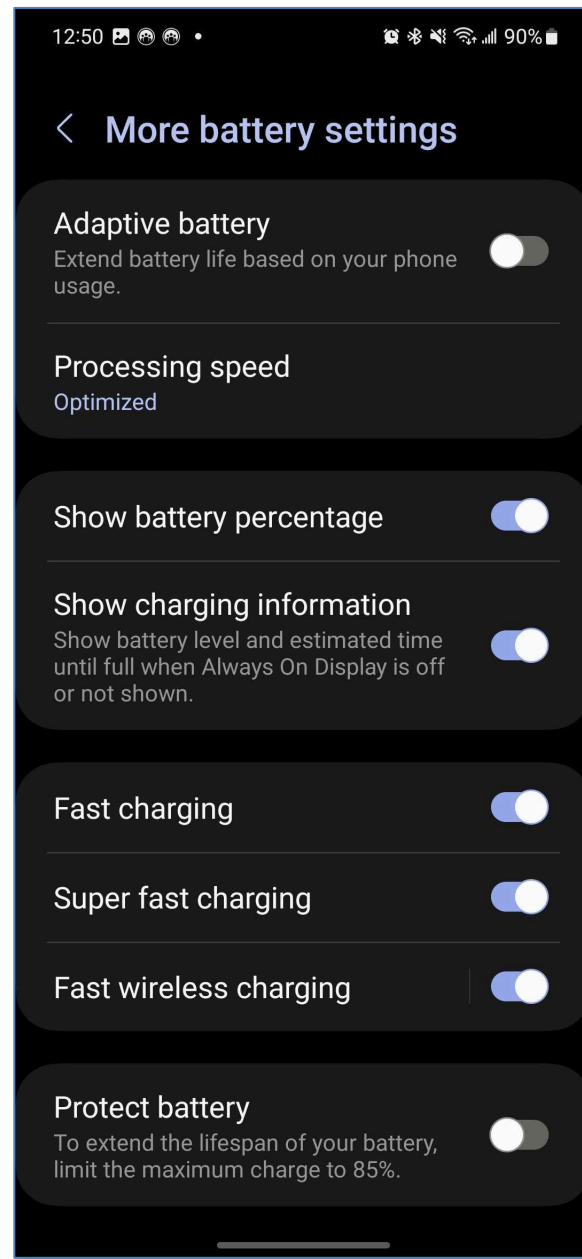
Claim	Public Documentation
	<div data-bbox="598 248 1602 756"><p>Turn Data saver on or off</p><p>Data saver prevents some apps from sending or receiving data in the background. So rest assured, you're not wasting any precious data.</p><ol style="list-style-type: none">1. Navigate to and open Settings, and then tap Connections.2. Tap Data usage, tap Data saver, and then tap the switch next to Turn on now.3. If there are still some apps you'd like to run in the background, you can set them as exceptions. Tap Allowed to use data while Data saver is on at the bottom of the screen.4. Tap More options (the three vertical dots) and choose Show system apps or Show allowed apps first to narrow down the list.5. Finally, tap the switch(es) next to your desired app(s).</div>  <p>; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:</p>

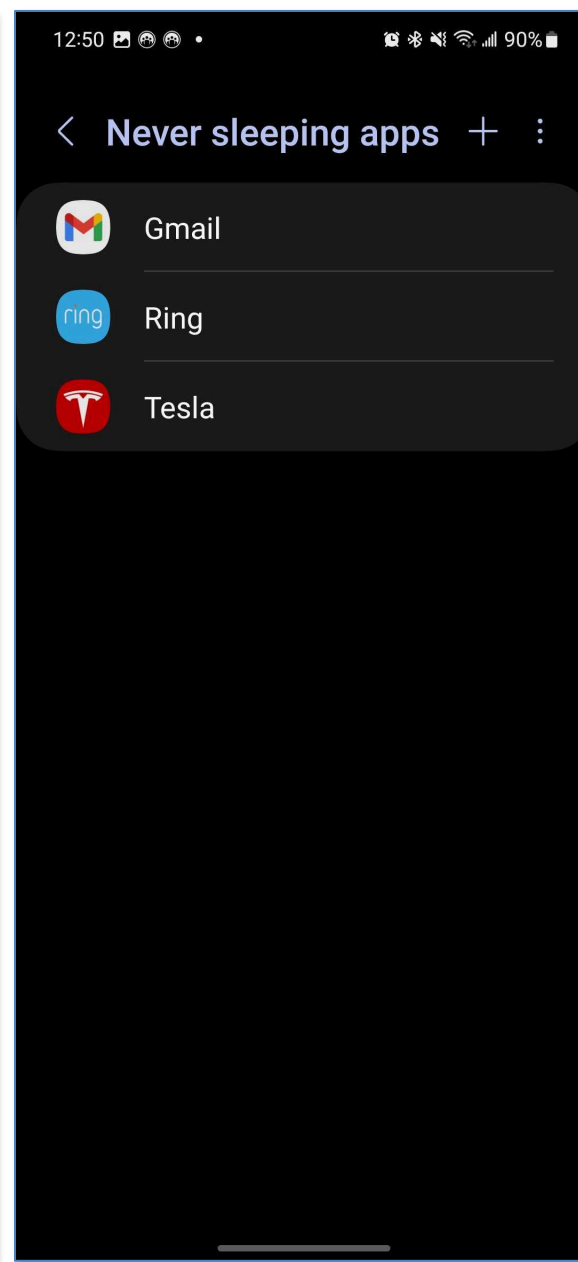
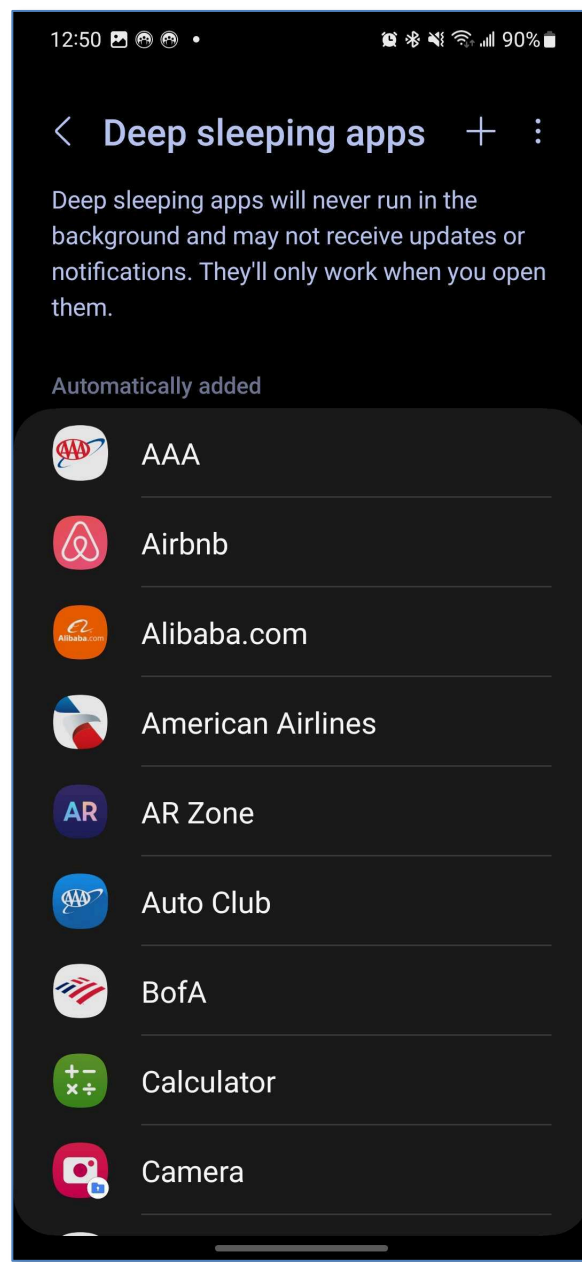
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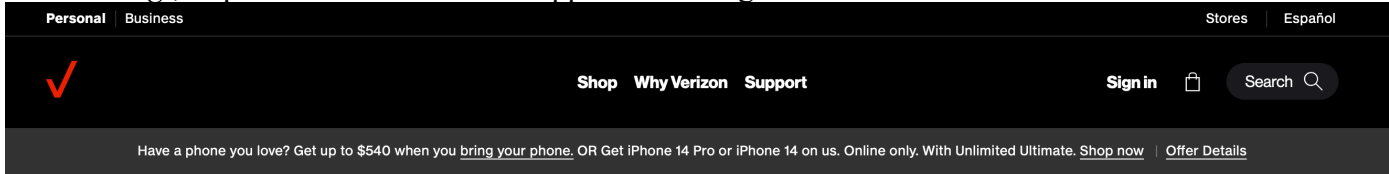
Claim	Public Documentation
	<p data-bbox="598 256 1432 310">6 Toggle the switches on next to the apps that you need to receive notifications from all the time. Email, Messages, Messenger, Instagram and Facebook are all popular options to allow unrestricted data access..</p>  <p data-bbox="583 1076 1402 1112">; https://www.samsung.com/us/support/answer/ANS00078987/:</p>

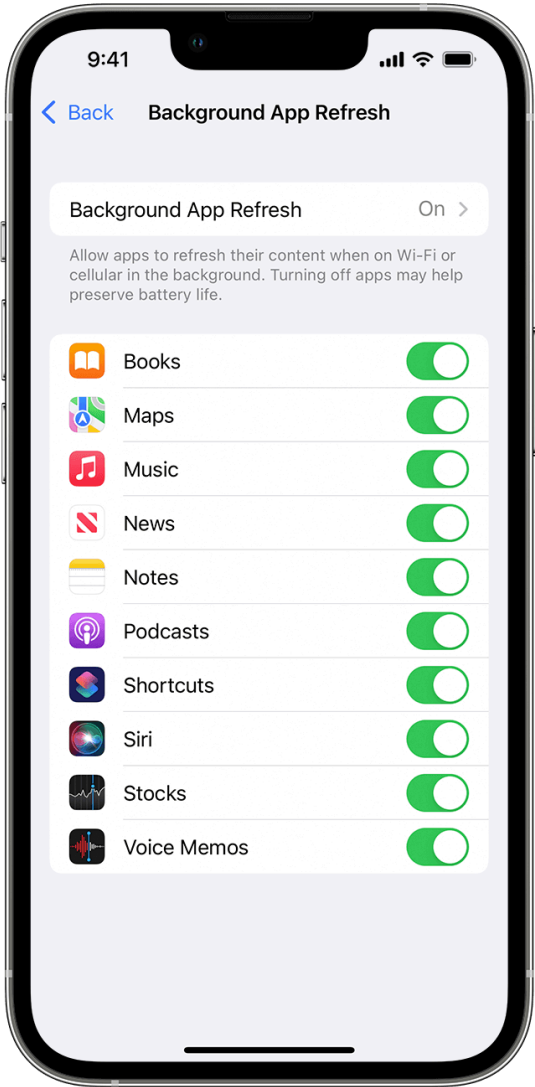
Claim	Public Documentation
	<div data-bbox="594 245 1831 862"><div data-bbox="594 245 1831 284">Power saving mode ✓</div><p data-bbox="594 329 1831 415">Note: Using Power saving mode can affect app and device performance. Some tasks and features may take longer to complete or update. Additionally, apps running in the background may not receive updates or send you notifications when Power saving mode is enabled.</p><p data-bbox="594 443 1831 467">Before you turn in for the night, change your phone's power mode. This will decrease your phone's performance and save battery life.</p><div data-bbox="594 509 1171 735"><ol style="list-style-type: none">1. Navigate to and open Settings, and then tap Battery and device care.2. Tap Battery, and then tap Power saving.3. Tap the switches next to your desired settings or customizations.4. Finally, tap the switch at the top of the screen to activate Power saving mode.</div><p data-bbox="594 761 1171 847">You will not be able to adjust the settings once the mode is enabled. If you want to change any of the settings, you'll need to temporarily disable Power saving mode.</p></div>  <p data-bbox="583 881 1144 914">; see also the exemplary screenshots below:</p>







Claim	Public Documentation
	<p>See also, e.g., https://www.verizon.com/support/knowledge-base-207174/:</p>  <p>The screenshot shows the Verizon Support website. At the top, there are links for 'Personal' and 'Business', and 'Stores' and 'Español'. Below this is a navigation bar with 'Shop', 'Why Verizon', and 'Support'. There is a 'Sign in' button and a search bar. A promotional banner at the bottom of the navigation bar says: 'Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details'. Below the banner, the breadcrumb trail reads: 'Support > Apple > Apple iPhone 7 Plus'. The main heading is 'Apple iPhone - Turn Background App Refresh On / Off'. Below the heading is a 'NOTE' box that says: 'When Background App Refresh is turned on, apps that take advantage of this feature can refresh themselves in the background. For additional info, refer to multitasking and background app refresh.' Below the note is a list of steps: 1. From a Home screen on your Settings [gear icon] > General. → If an app isn't available on your Home screen, swipe left to access the App Library. 2. Tap Background App Refresh twice then tap one of the following: → When low power mode is on, the background app refresh is disabled. • Off • Wi-Fi • Wi-Fi and Cellular Data</p> <p>https://support.apple.com/en-us/HT202070:</p>

Claim	Public Documentation
	<div data-bbox="604 305 1297 362"><h2>Use Background App Refresh</h2></div> <div data-bbox="604 391 1377 638"><p>After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content.</p></div> <div data-bbox="604 670 1373 878"><p>If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again.</p></div> <div data-bbox="583 1377 1144 1411"><p>https://support.apple.com/en-us/HT205234:</p></div> <div data-bbox="1436 261 1967 1341"></div>

Use Low Power Mode to save battery life on your iPhone or iPad


Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

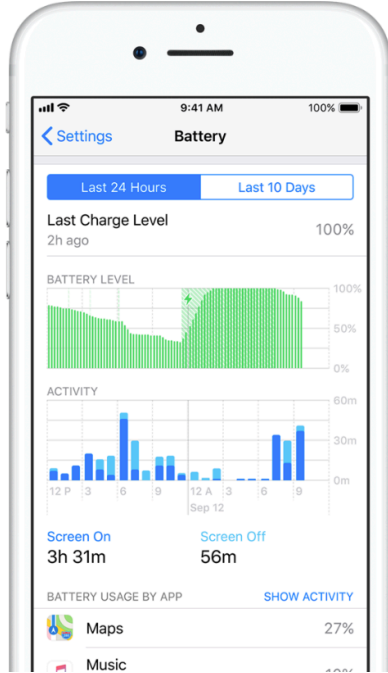
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models¹
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display²
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon  and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.








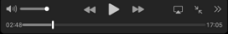



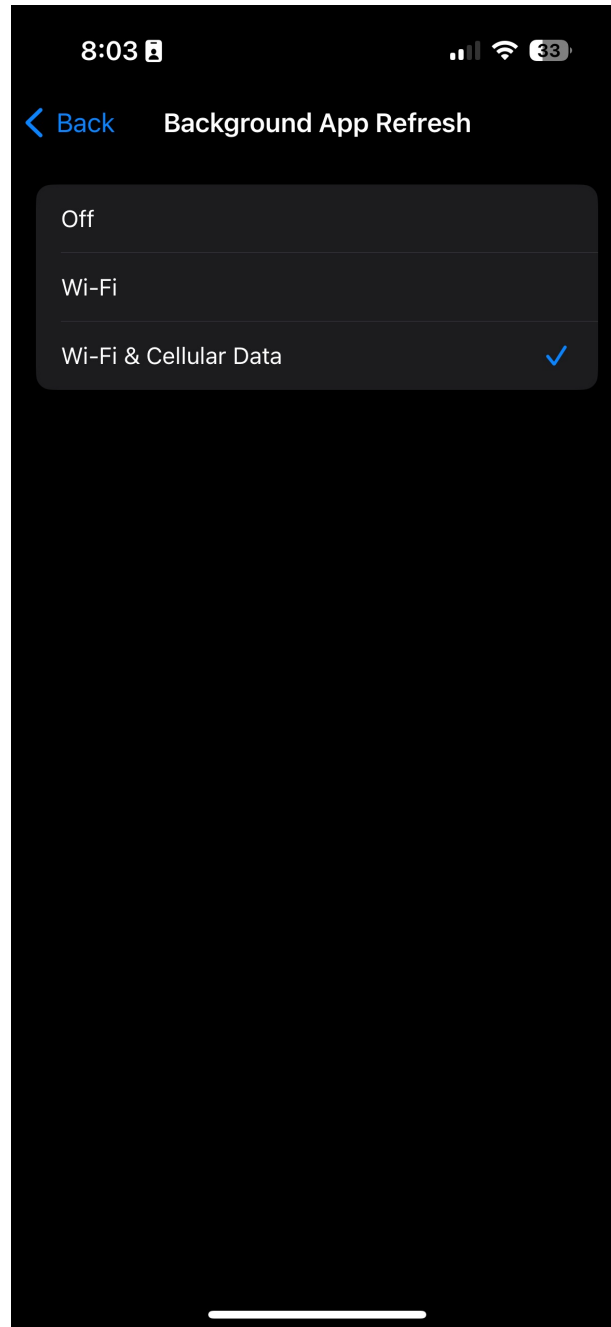
1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).


2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.



Claim	Public Documentation
	<p>https://www.apple.com/batteries/maximizing-performance/:</p> <h2 data-bbox="625 305 1396 358">View Battery Usage information</h2> <p data-bbox="625 378 1314 500">With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.</p> <p data-bbox="625 529 1293 586">Here are the messages you may see listed below the apps you've been using:</p> <p data-bbox="625 656 1293 748">Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.</p> <ul data-bbox="657 781 1314 1024" style="list-style-type: none"> • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. <p data-bbox="590 1068 1356 1101">; https://developer.apple.com/videos/play/wwdc2020/10063:</p> 

Claim	Public Documentation
	<div data-bbox="585 237 1820 933"><h3>Factors affecting your runtime</h3><div>Critically low battery Background App Refresh switch Airplane mode</div><div>Low Power Mode Ongoing iCloud restore Settings Display on/off state</div><div>Device temperature System budgets Process contention App usage</div><div>App switcher Rate limiting Camera in-use Device lock state</div><div data-bbox="1089 886 1316 922"><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>02:1017:08</div></div></div>

Claim	Public Documentation
	<div data-bbox="583 240 1822 933"><h3>Top factors</h3><ul style="list-style-type: none"> Critically low battery Low Power Mode App usage App switcher Background App Refresh switch System budgets Rate limiting</div> <p data-bbox="583 938 1108 971">; see also exemplary screen shots below:</p>



Claim	Public Documentation
	 <p>The image shows three Apple Watch screens side-by-side. The first screen is the 'Settings' menu, showing options for General, Do Not Disturb, and Airplane Mode. The second screen is the 'General' settings menu, showing options for Software Update, Orientation, Background App Refresh, and Wake Screen. The third screen is the 'Background App Refresh' settings menu, showing a toggle switch for 'Background App Refresh' which is currently turned off. Below the toggle, there is explanatory text: 'Turning off Background App Refresh may preserve battery life. Apps with complications on the current watch face will continue to refresh, even when their background app refresh setting is off.'</p>
<p>[1g] one or more processors configured to</p>	<p>The Accused Instrumentalities include “one or more processors.”</p> <p>For example, the Galaxy S22 has either a Snapdragon (in the United States) or Exynos (in Korea) architecture-based application processor. <i>See, e.g.,</i> https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:</p>

Claim	Public Documentation
	<div data-bbox="592 318 1346 565"><p data-bbox="835 496 1081 526">Snapdragon 8 Gen 1</p></div> <p data-bbox="585 620 1986 688">For further example, the Apple iPhone 15 Pro model has a A17 Pro Chip. <i>See, e.g.,</i> https://www.apple.com/iphone-15-pro/specs/</p> <div data-bbox="585 727 1827 1013"><div data-bbox="594 792 663 824">Chip</div><div data-bbox="924 797 1089 961"></div><div data-bbox="1167 800 1764 948"><p>A17 Pro chip</p><p>New 6-core CPU with 2 performance and 4 efficiency cores</p><p>New 6-core GPU</p><p>New 16-core Neural Engine</p></div></div>

[1h] classify a wireless network to which the device currently connects in order to communicate data for Internet service activities as at least one of a plurality of network types that the device can connect with,

The Accused Instrumentalities “classify a wireless network to which the device currently connects in order to communicate data for Internet service activities as at least one of a plurality of network types that the device can connect with.”

For example, devices sold and used by Verizon classify wireless network connections for communicating internet service activities. *See, e.g.,* <https://developer.android.com/reference/android/net/ConnectivityManager>:

ConnectivityManager

Added in API level 1

[Kotlin](#) | [Java](#)

```
public class ConnectivityManager
    extends Object
```

[java.lang.Object](#)
↳ [android.net.ConnectivityManager](#)

Class that answers queries about the state of network connectivity. It also notifies applications when network connectivity changes.

The primary responsibilities of this class are to:

1. Monitor network connections (Wi-Fi, GPRS, UMTS, etc.)
2. Send broadcast intents when network connectivity changes
3. Attempt to "fail over" to another network when connectivity to a network is lost
4. Provide an API that allows applications to query the coarse-grained or fine-grained state of the available networks
5. Provide an API that allows applications to request and select networks for their data traffic

Claim	Public Documentation
	https://developer.android.com/training/monitoring-device-state/connectivity-status-type ; https://www.verizon.com/support/knowledge-base-236117/ ; https://www.samsung.com/us/support/answer/ANS00079018/ ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/ ; https://www.samsung.com/us/support/answer/ANS00078987/ ; https://developer.android.com/training/basics/network-ops/data-saver ; https://developer.android.com/training/monitoring-device-state/doze-standby ; https://developer.android.com/topic/performance/appstandby :

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.



★ **Note:** Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

1. **Active:** App is currently being used or was very recently used.
2. **Working set:** App is in regular use.
3. **Frequent:** App is often used, but not every day.
4. **Rare:** App is not frequently used.
5. **Restricted:** App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

Claim	Public Documentation
	<div data-bbox="596 259 1814 371"> <p>★ Note: Unlike other buckets, these power management restrictions apply to the restricted bucket even when the device is charging. However, restrictions are loosened when the device is charging, idle, and on an unmetered network.</p> </div> <p> https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; https://developer.android.com/guide/components/activities/intro-activities; https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; https://techshift.net/does-data-saver-apply-to-wi-fi/; </p> <p>“Does data saver apply to Wi-Fi?</p> <p>Does data saver affect WiFi? No, it doesn’t. Data saver only restricts the apps from using mobile data. While you are on WiFi, your phone’s data saver won’t affect it.”</p> <p>; https://www.technipages.com/how-to-give-android-apps-unrestricted-data-access-data-saver-on:</p> <p>“The Data Saver option is only when you’re not on WiFi and affects how you see your content.”</p> <p><i>See also, e.g.,</i> https://www.verizon.com/support/knowledge-base-207174/:</p>


Claim	Public Documentation
	<div data-bbox="583 240 1963 412"><div><div>Personal Business</div><div>Stores Español</div></div><div>Shop Why Verizon Support</div><div>Sign in  <input data-bbox="1816 310 1906 326" type="text" value="Search"/></div></div> <div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div>

[Support](#) > [Apple](#) > [Apple iPhone 7 Plus](#)

Apple iPhone - Turn Background App Refresh On / Off

NOTE

When Background App Refresh is turned on, apps that take advantage of this feature can refresh themselves in the background. For additional info, refer to [multitasking and background app refresh](#).

1. From a Home screen on your **Settings**  **General**.
→ If an app isn't available on your Home screen, swipe left to access the App Library.
2. Tap **Background App Refresh** twice then tap one of the following:
→ When low power mode is on, the background app refresh is disabled.
 - Off
 - Wi-Fi
 - Wi-Fi and Cellular Data

<https://support.apple.com/en-us/HT202070>; <https://support.apple.com/en-us/HT205234>;

Use Low Power Mode to save battery life on your iPhone or iPad


Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

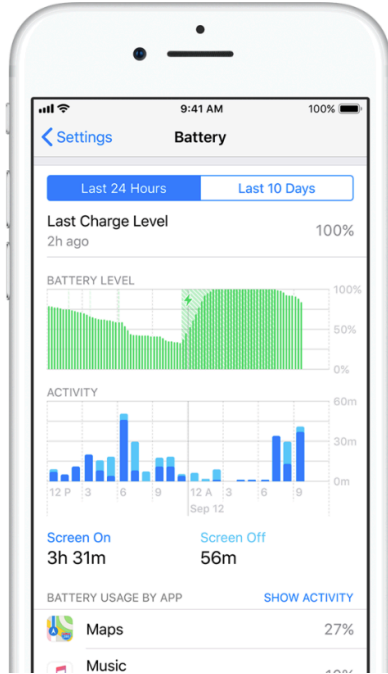
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models¹
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display²
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon  and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.










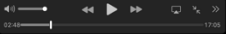

1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

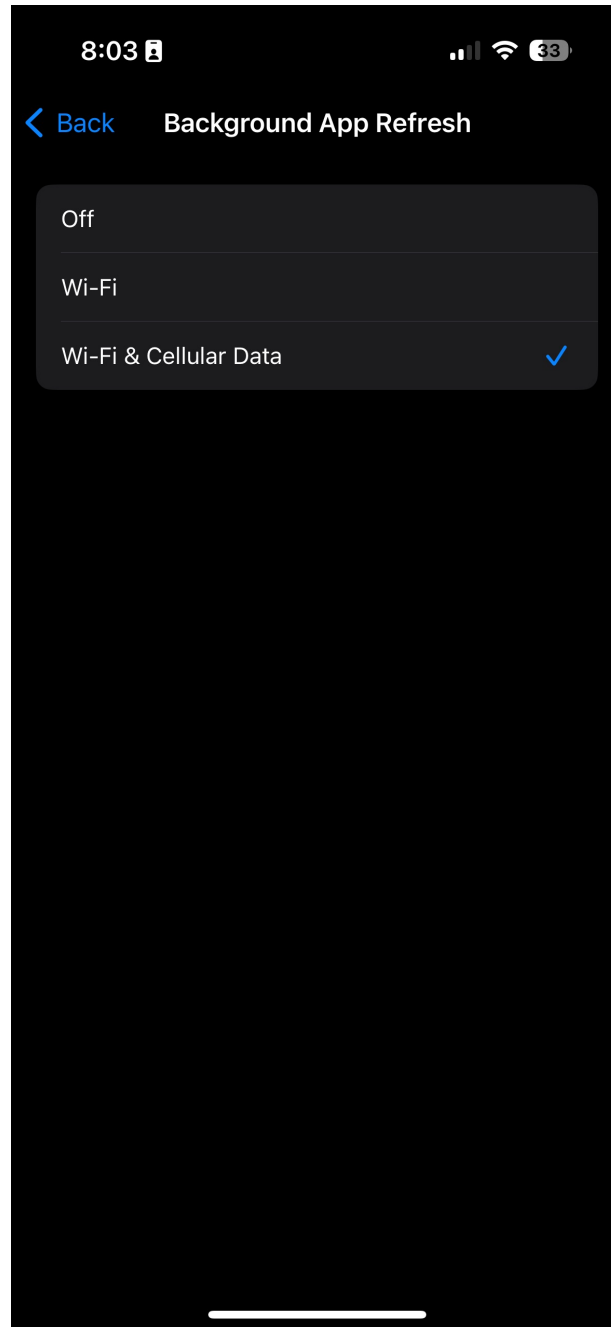
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.


Claim	Public Documentation
	<p data-bbox="583 240 1350 272">https://www.apple.com/batteries/maximizing-performance/:</p> <h2 data-bbox="625 302 1396 358">View Battery Usage information</h2> <p data-bbox="625 375 1316 500">With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.</p> <p data-bbox="625 526 1293 583">Here are the messages you may see listed below the apps you've been using:</p> <p data-bbox="625 652 1293 745">Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.</p> <ul data-bbox="657 776 1316 1024" style="list-style-type: none"> <li data-bbox="657 776 1316 901">• To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. <li data-bbox="657 932 1283 1024">• If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  <p data-bbox="583 1068 1988 1357">; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-</p>





Claim	Public Documentation
	<p> ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks/bgappprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocesstask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/device-management/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication/; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages/; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback/; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063/; </p>

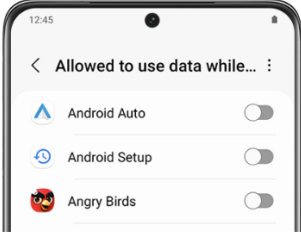
Claim	Public Documentation
	<div data-bbox="585 238 1820 933"><h3>Factors affecting your runtime</h3><div><div>Critically low battery</div><div>Background App Refresh switch</div><div>Airplane mode</div><div>Low Power Mode</div><div>Ongoing iCloud restore</div><div>Settings</div><div>Display on/off state</div><div>Device temperature</div><div>System budgets</div><div>Process contention</div><div>App usage</div><div>App switcher</div><div>Rate limiting</div><div>Camera in-use</div><div>Device lock state</div></div><div data-bbox="1089 886 1316 922"><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>02:1017:08</div></div></div>

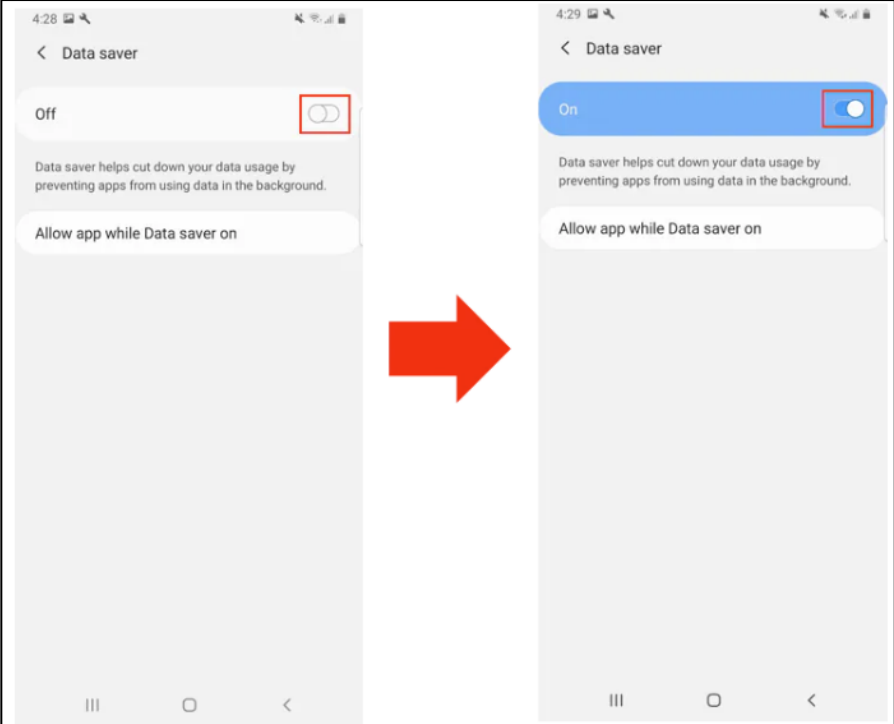
Claim	Public Documentation
	<div data-bbox="583 237 1822 935"><h3>Top factors</h3><ul style="list-style-type: none"> Critically low battery Low Power Mode App usage App switcher Background App Refresh switch System budgets Rate limiting</div> <p data-bbox="583 938 1108 974">; see also exemplary screen shots below:</p>

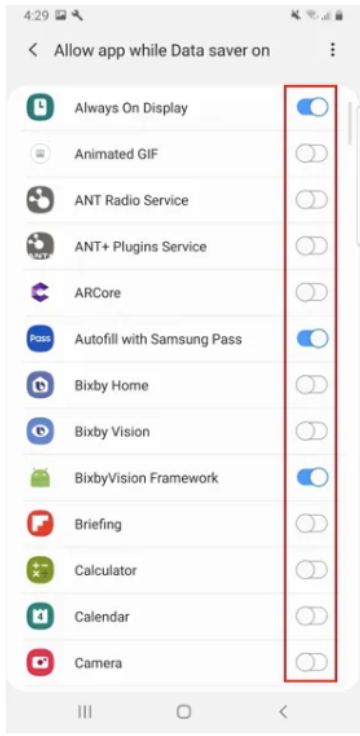


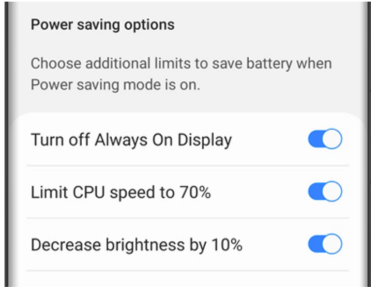
Claim	Public Documentation
	 <p>The image shows three Apple Watch screens side-by-side. The first screen is the 'Settings' menu, showing options for General, Do Not Disturb, and Airplane Mode. The second screen is the 'General' settings menu, showing options for Software Update, Orientation, Background App Refresh, and Wake Screen. The third screen is the 'Background App Refresh' settings menu, showing a toggle switch for 'Background App Refresh' which is currently turned off. Below the toggle, there is explanatory text: 'Turning off Background App Refresh may preserve battery life. Apps with complications on the current watch face will continue to refresh, even when their background app refresh setting is off.'</p>
<p>[1i] classify whether a particular application capable of both interacting with the user in a user interface foreground of the device, and at least some Internet service activities when not interacting with the user in the device user interface foreground,</p>	<p>The Accused Instrumentalities “classify whether a particular application capable of both interacting with the user in a user interface foreground of the device, and at least some Internet service activities when not interacting with the user in the device user interface foreground.”</p> <p>For example, phones and tablets sold and used by Verizon classify applications and internet service activities in both foreground and background. <i>See, e.g.,</i> https://www.verizon.com/support/knowledge-base-236117/:</p>


Claim	Public Documentation
	<div data-bbox="617 269 1562 380"><h2>Samsung Galaxy S21 5G / Galaxy S21 Ultra 5G - Manage Data Usage</h2></div> <div data-bbox="653 472 722 493"><p>NOTE</p></div> <div data-bbox="684 519 1518 690"><ul style="list-style-type: none">• Data usage info provided by the device may differ from actual usage. For data usage info provided by Verizon, refer to the My Verizon website.•  For a better understanding of how data is used, check out this video.• To control data usage on your account, refer to Verizon Smart Family™.</div> <div data-bbox="623 789 1457 1096"><ol style="list-style-type: none">1. From a Home screen, swipe up from the center of the display to access the apps screen. → These instructions only apply to Standard mode and the default Home screen layout.2. Navigate: Settings  Connections.3. Tap Data usage then do any of the following:<ul style="list-style-type: none">• Turn Data saver off<ol style="list-style-type: none">a. Tap Data saver.b. Tap the Data saver switch to turn on  or off  . → Data saver must be turned off to use Mobile Hotspot.</div> <div data-bbox="588 1148 1400 1180"><p>; https://www.samsung.com/us/support/answer/ANS00079018/:</p></div>

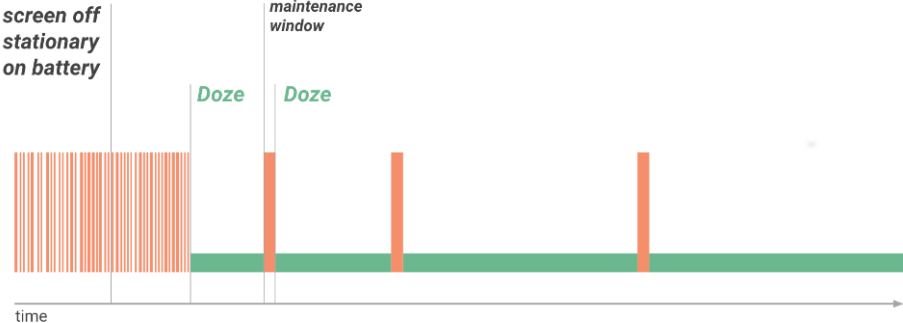
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	<div data-bbox="598 248 1602 756"><p>Turn Data saver on or off</p><p>Data saver prevents some apps from sending or receiving data in the background. So rest assured, you're not wasting any precious data.</p><ol style="list-style-type: none">1. Navigate to and open Settings, and then tap Connections.2. Tap Data usage, tap Data saver, and then tap the switch next to Turn on now.3. If there are still some apps you'd like to run in the background, you can set them as exceptions. Tap Allowed to use data while Data saver is on at the bottom of the screen.4. Tap More options (the three vertical dots) and choose Show system apps or Show allowed apps first to narrow down the list.5. Finally, tap the switch(es) next to your desired app(s).</div>  <p>; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/;</p>

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	<p data-bbox="598 256 1432 310">6 Toggle the switches on next to the apps that you need to receive notifications from all the time. Email, Messages, Messenger, Instagram and Facebook are all popular options to allow unrestricted data access..</p>  <p data-bbox="583 1076 1402 1112">; https://www.samsung.com/us/support/answer/ANS00078987/:</p>

Claim	Public Documentation
	<div data-bbox="594 245 1831 862"> <h3>Power saving mode ✓</h3> <p>Note: Using Power saving mode can affect app and device performance. Some tasks and features may take longer to complete or update. Additionally, apps running in the background may not receive updates or send you notifications when Power saving mode is enabled.</p> <p>Before you turn in for the night, change your phone's power mode. This will decrease your phone's performance and save battery life.</p> <ol style="list-style-type: none"> 1. Navigate to and open Settings, and then tap Battery and device care. 2. Tap Battery, and then tap Power saving. 3. Tap the switches next to your desired settings or customizations. 4. Finally, tap the switch at the top of the screen to activate Power saving mode. <p>You will not be able to adjust the settings once the mode is enabled. If you want to change any of the settings, you'll need to temporarily disable Power saving mode.</p>  <p>The screenshot shows a 'Power saving options' menu with three toggle switches, all of which are turned on. The options are: 'Turn off Always On Display', 'Limit CPU speed to 70%', and 'Decrease brightness by 10%'.</p> </div> <p>; https://developer.android.com/training/basics/network-ops/data-saver:</p> <div data-bbox="594 958 1617 1390"> <h3>Optimize network data usage 🔖</h3> <p>Over the life of a smartphone, the cost of a cellular data plan can easily exceed the cost of the device itself. On Android 7.0 (API level 24) and higher, users can enable Data Saver on a device-wide basis in order to optimize their device's data usage, and use less data. This ability is especially useful when roaming, near the end of the billing cycle, or for a small prepaid data pack.</p> <p>When a user enables Data Saver in Settings and the device is on a metered network, the system blocks background data usage and signals apps to use less data in the foreground wherever possible. Users can allow specific apps to use background metered data usage even when Data Saver is turned on.</p> <p>Android 7.0 (API level 24) extends the <code>ConnectivityManager</code> API to provide apps with a way to retrieve the user's Data Saver preferences and monitor preference changes. It is considered good practice for apps to check whether the user has enabled Data Saver and make an effort to limit foreground and background data usage.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1577 797"> <h3>Check data saver preferences</h3> <p>On Android 7.0 (API level 24) and higher, apps can use the <code>ConnectivityManager</code> API to determine what data usage restrictions are being applied. The <code>getRestrictBackgroundStatus()</code> method returns one of the following values:</p> <p><code>RESTRICT_BACKGROUND_STATUS_DISABLED</code></p> <p>Data Saver is disabled.</p> <p><code>RESTRICT_BACKGROUND_STATUS_ENABLED</code></p> <p>The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.</p> <p><code>RESTRICT_BACKGROUND_STATUS_WHITELISTED</code></p> <p>The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.</p> <p>Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses <code>ConnectivityManager.isActiveNetworkMetered()</code> and <code>ConnectivityManager.getRestrictBackgroundStatus()</code> to determine how much data the app should use:</p> </div> <p data-bbox="594 816 1593 849">; https://developer.android.com/training/monitoring-device-state/doze-standby;</p> <div data-bbox="594 857 1829 1357"> <h2>Optimize for Doze and App Standby </h2> <p>Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. <i>Doze</i> reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. <i>App Standby</i> defers background network activity for apps with which the user has not recently interacted.</p> <p>While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.</p> <p>Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1545 870"> <h3>Understanding Doze</h3> <p>If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms.</p> <p>Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this <i>maintenance window</i>, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.</p>  <p>Figure 1. Doze provides a recurring maintenance window for apps to use the network and handle pending activities.</p> </div> <div data-bbox="594 894 1646 1065"> <p>At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger.</p> <p>As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity.</p> </div> <div data-bbox="594 1089 1831 1219"> <p>The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible.</p> </div> <p>; https://developer.android.com/topic/performance/appstandby:</p>

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

★ **Note:** Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

1. **Active:** App is currently being used or was very recently used.
2. **Working set:** App is in regular use.
3. **Frequent:** App is often used, but not every day.
4. **Rare:** App is not frequently used.
5. **Restricted:** App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

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	<p> https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/process-lifecycle; </p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>1. A foreground process is one that is required for what the user is currently doing. Various application components can cause its containing process to be considered foreground in different ways. A process is considered to be in the foreground if any of the following conditions hold:</p> <ul style="list-style-type: none"> • It is running an Activity at the top of the screen that the user is interacting with (its onResume() method has been called). • It has a BroadcastReceiver that is currently running (its BroadcastReceiver.onReceive() method is executing). • It has a Service that is currently executing code in one of its callbacks (Service.onCreate(), Service.onStart(), or Service.onDestroy()). <p>There will only ever be a few such processes in the system, and these will only be killed as a last resort if memory is so low that not even these processes can continue to run. Generally, at this point, the device has reached a memory paging state, so this action is required in order to keep the user interface responsive.</p> </div> <p> https://developer.android.com/guide/background; </p>

Claim	Public Documentation
	<div data-bbox="594 245 1831 631">Definition of background work<p>An app is running in the <i>background</i> when both the following conditions are satisfied:</p><ul style="list-style-type: none">• None of the app's activities are currently visible to the user.• The app isn't running any foreground services that started while an activity from the app was visible to the user.<p>Otherwise, the app is running in the <i>foreground</i>.</p></div> <p data-bbox="594 651 1348 683">; https://developer.android.com/guide/components/services;</p>

Types of Services

These are the three different types of services:

Foreground

A foreground service performs some operation that is noticeable to the user. For example, an audio app would use a foreground service to play an audio track. Foreground services must display a [Notification](#). Foreground services continue running even when the user isn't interacting with the app.

When you use a foreground service, you must display a notification so that users are actively aware that the service is running. This notification cannot be dismissed unless the service is either stopped or removed from the foreground.

Learn more about how to configure [foreground services](#) in your app.

★ **Note:** The [WorkManager](#) API offers a flexible way of scheduling tasks, and is able to [run these jobs as foreground services](#) if needed. In many cases, using WorkManager is preferable to using foreground services directly.

Background

A background service performs an operation that isn't directly noticed by the user. For example, if an app used a service to compact its storage, that would usually be a background service.

★ **Note:** If your app targets API level 26 or higher, the system imposes [restrictions on running background services](#) when the app itself isn't in the foreground. In most situations, for example, you shouldn't [access location information from the background](#). Instead, [schedule tasks using WorkManager](#).

Bound

A service is *bound* when an application component binds to it by calling `bindService()`. A bound service offers a client-server interface that allows components to interact with the service, send requests, receive results, and even do so across processes with interprocess communication (IPC). A bound service runs only as long as another application component is bound to it. Multiple components can bind to the service at once, but when all of them unbind, the service is destroyed.

Claim	Public Documentation
	<p>; https://developer.android.com/guide/components/activities/activity-lifecycle:</p> <h3>Activity-lifecycle concepts</h3> <p>To navigate transitions between stages of the activity lifecycle, the <code>Activity</code> class provides a core set of six callbacks: <code>onCreate()</code>, <code>onStart()</code>, <code>onResume()</code>, <code>onPause()</code>, <code>onStop()</code>, and <code>onDestroy()</code>. The system invokes each of these callbacks as the activity enters a new state.</p> <p>Figure 1 presents a visual representation of this paradigm.</p> <p>As the user begins to leave the activity, the system calls methods to dismantle the activity. In some cases, the activity is only partially dismantled and still resides in memory, such as when the user switches to another app. In these cases, the activity can still come back to the foreground.</p> <p>If the user returns to the activity, it resumes from where the user left off. With a few exceptions, apps are restricted from starting activities when running in the background.</p> <p>The system's likelihood of killing a given process, along with the activities in it, depends on the state of the activity at the time. For more information on the relationship between state and vulnerability to ejection, see the section about activity state and ejection from memory.</p> <p>Depending on the complexity of your activity, you probably don't need to implement all the lifecycle methods. However, it's important that you understand each one and implement those that make your app behave the way users expect.</p> <p>; https://developer.android.com/guide/components/activities/intro-activities; <i>see also</i> the exemplary screenshots below:</p>

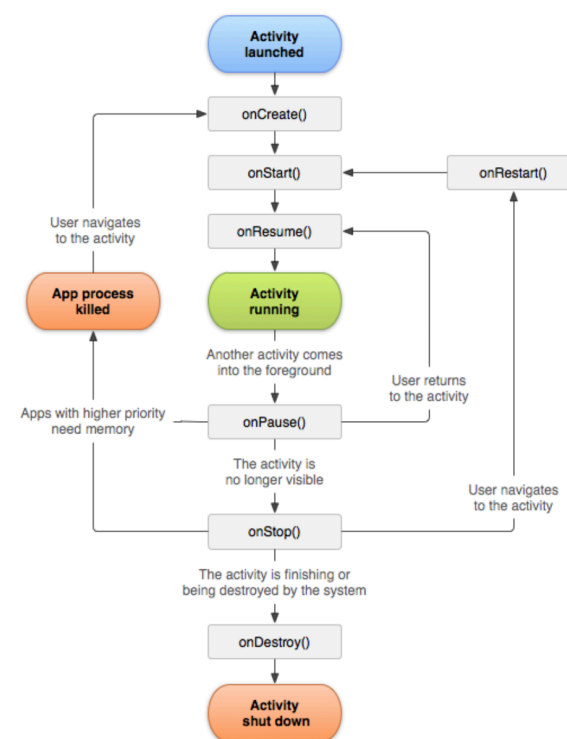
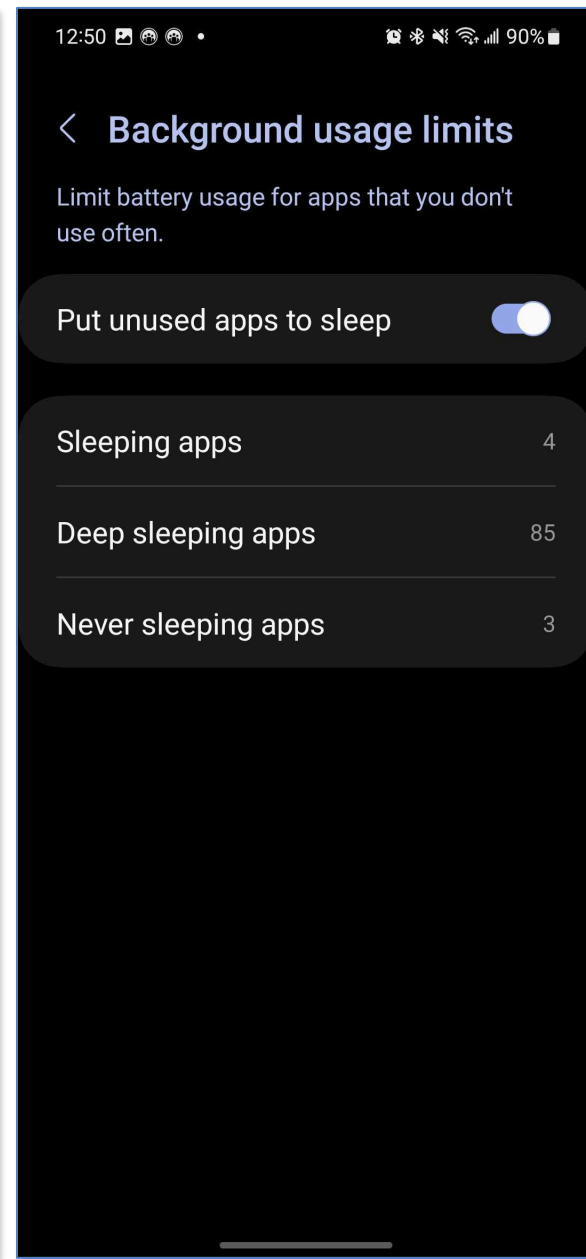
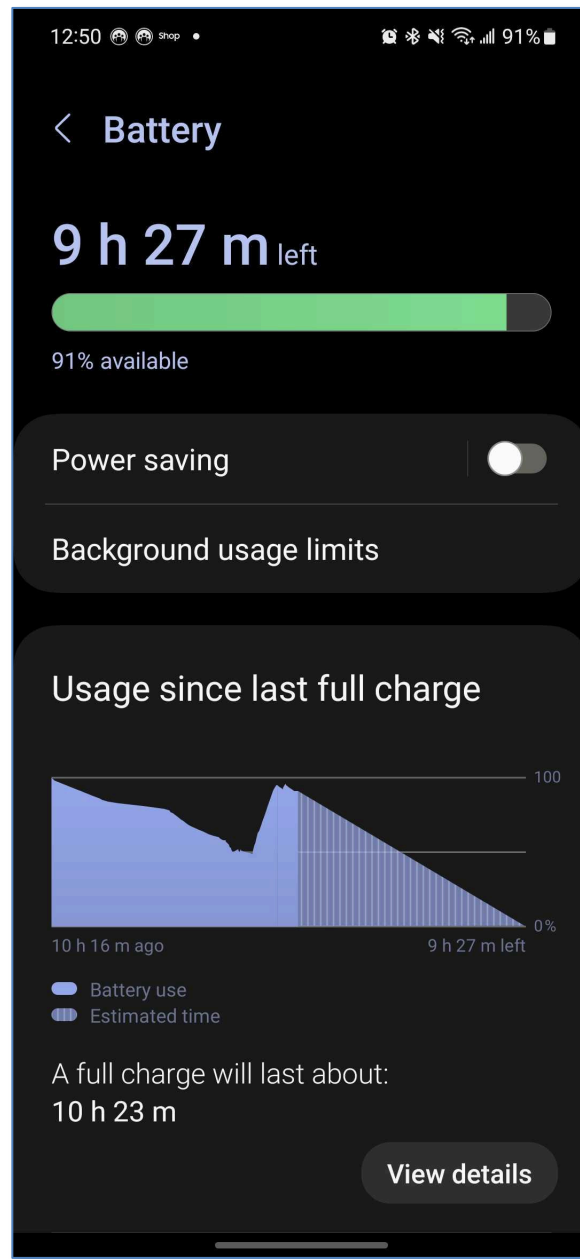
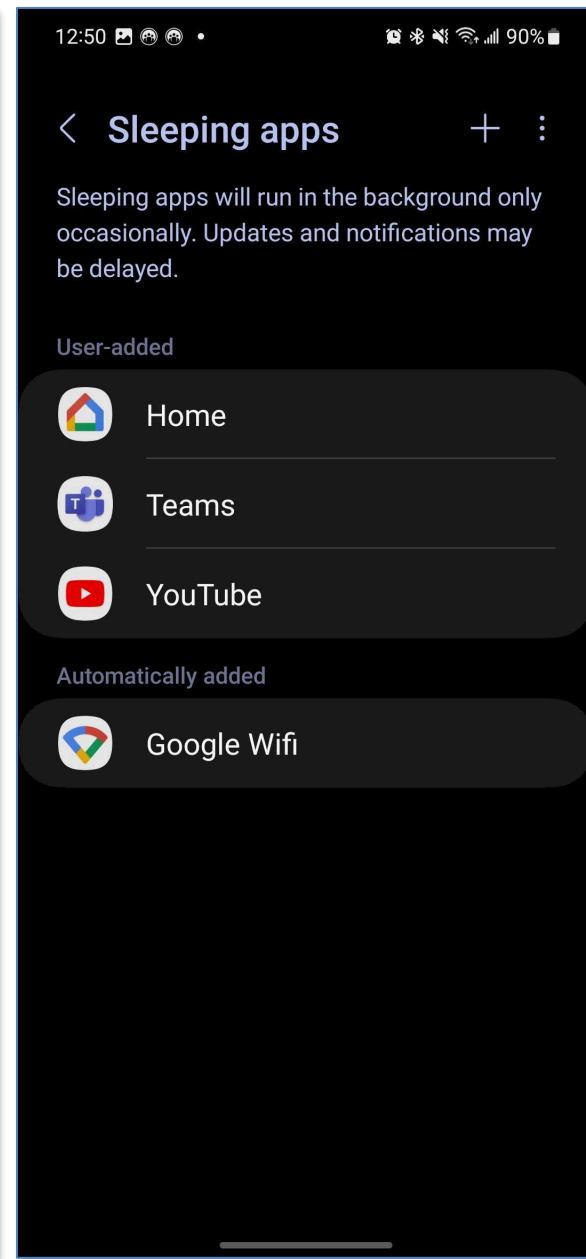
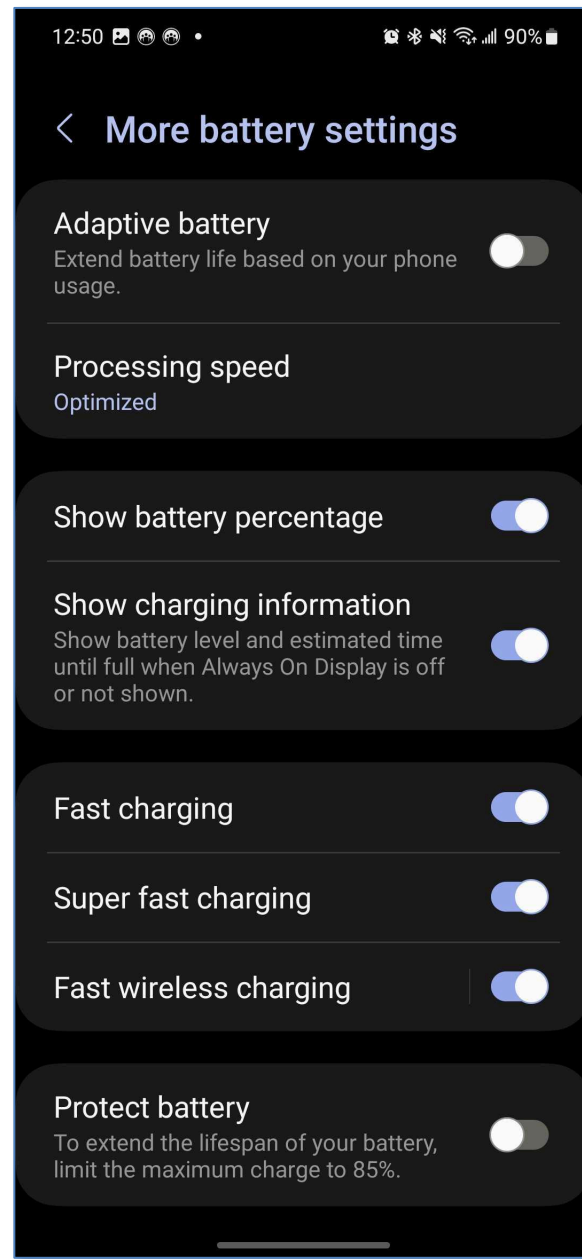
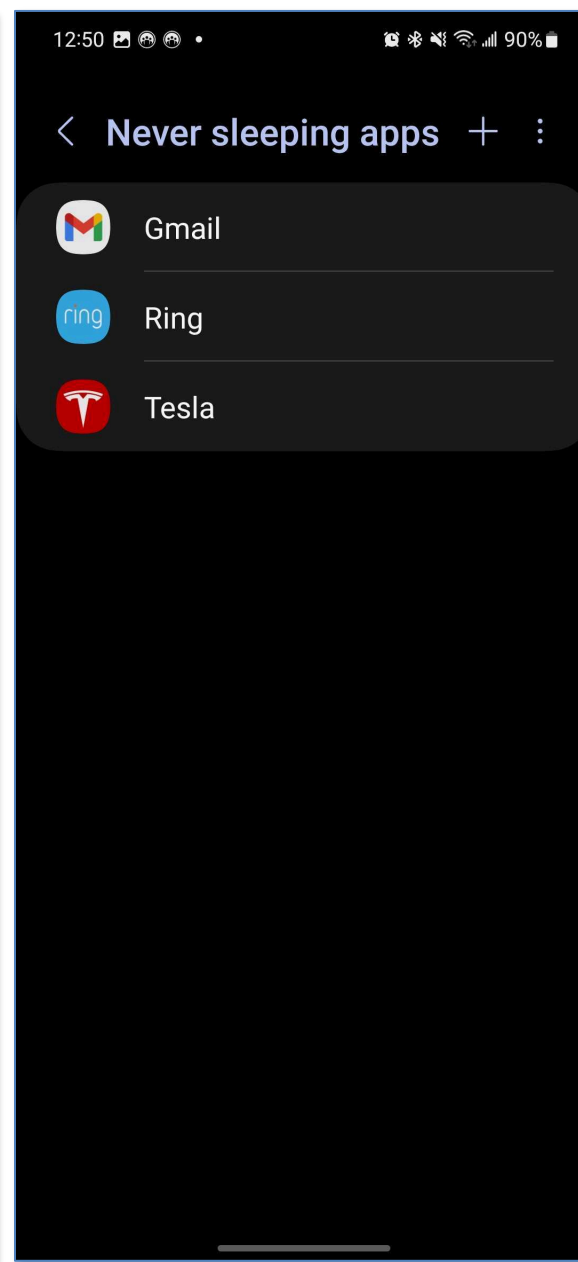
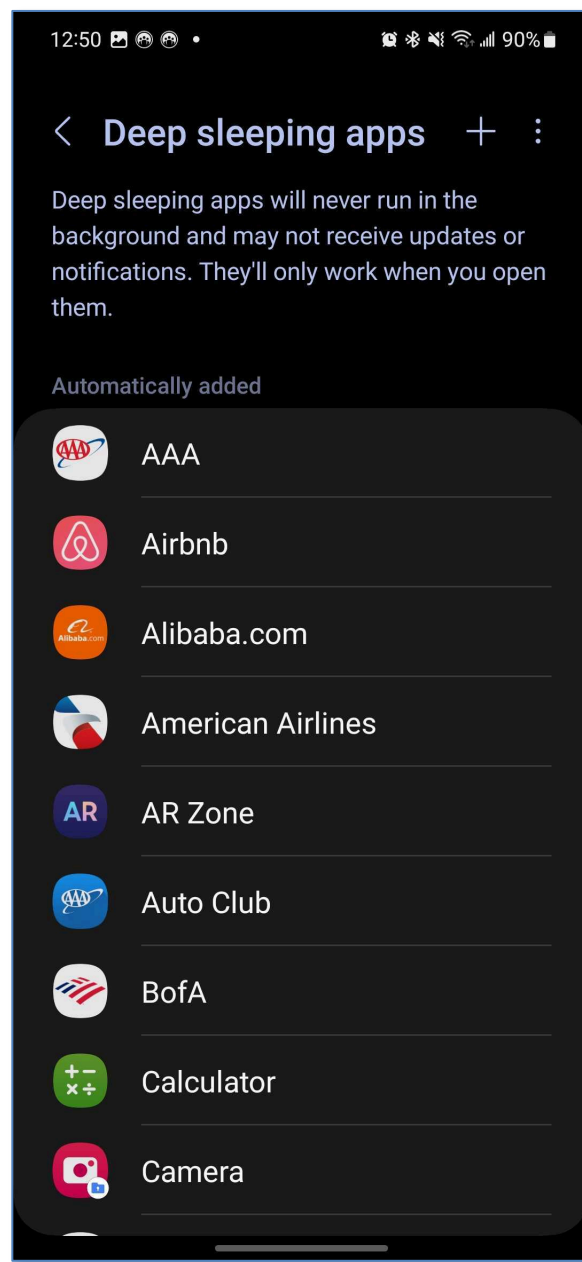






Figure 1. A simplified illustration of the activity lifecycle.

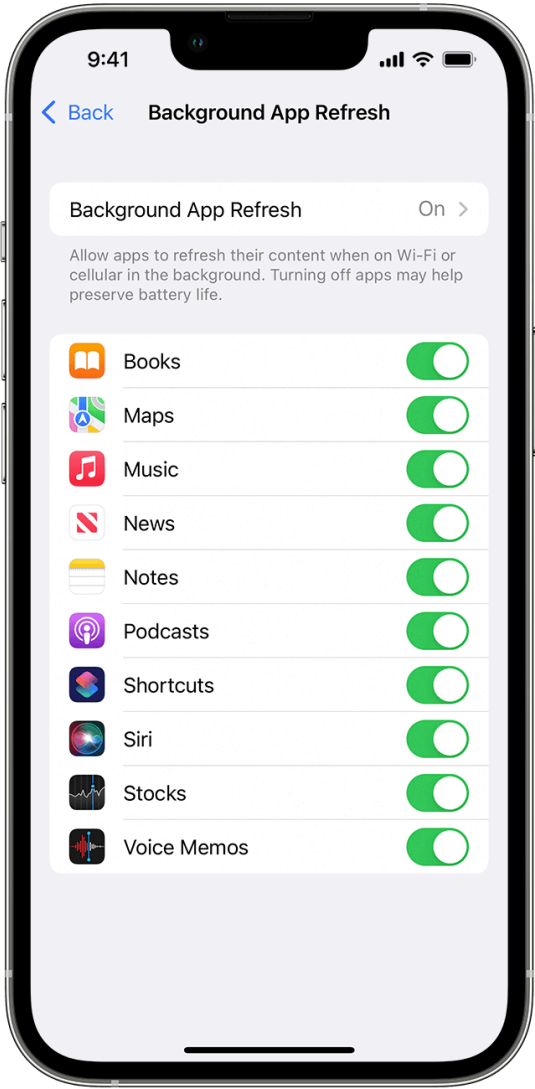






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	<p data-bbox="583 245 1423 277"><i>See also, e.g.,</i> https://www.verizon.com/support/data-usage-faqs/:</p> <p data-bbox="625 380 1310 418">What is indirect or background data usage? ^</p> <p data-bbox="625 479 1875 547">Indirect data usage occurs in the background, during tasks performed automatically by your device. Some examples of indirect data usage are:</p> <ul data-bbox="617 587 1194 841" style="list-style-type: none"><li data-bbox="617 587 1194 620">• Automatic backups of pictures or videos<li data-bbox="617 660 915 693">• Software updates<li data-bbox="617 734 972 766">• App content refreshes<li data-bbox="617 807 1066 839">• Syncing and location services <p data-bbox="625 883 1381 915">Note: You can adjust these functions in your device Settings.</p> <p data-bbox="583 972 1369 1005">; https://www.verizon.com/support/knowledge-base-207174/:</p>

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	<div><div><div><div>PersonalBusiness</div><div>StoresEspañol</div></div><div><div></div><div>ShopWhy VerizonSupport</div><div>Sign inSearch</div></div><div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div></div><div><div>Support > Apple > Apple iPhone 7 Plus</div><div><h1>Apple iPhone - Turn Background App Refresh On / Off</h1><div><div>NOTE<p>When Background App Refresh is turned on, apps that take advantage of this feature can refresh themselves in the background. For additional info, refer to multitasking and background app refresh.</p></div><div><div><div>1. From a Home screen on your Settings  General. → If an app isn't available on your Home screen, swipe left to access the App Library.</div><div>2. Tap Background App Refresh twice then tap one of the following: → When low power mode is on, the background app refresh is disabled.<ul style="list-style-type: none">OffWi-FiWi-Fi and Cellular Data</div></div></div><div>https://support.apple.com/en-us/HT202070:</div></div></div></div></div>

Claim	Public Documentation
	<div data-bbox="606 305 1297 363"><h2>Use Background App Refresh</h2></div> <div data-bbox="606 391 1377 638"><p>After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content.</p></div> <div data-bbox="606 672 1373 878"><p>If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again.</p></div> <div data-bbox="588 1377 1144 1412"><p>https://support.apple.com/en-us/HT205234:</p></div> <div data-bbox="1436 261 1967 1343"></div>

Use Low Power Mode to save battery life on your iPhone or iPad


Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

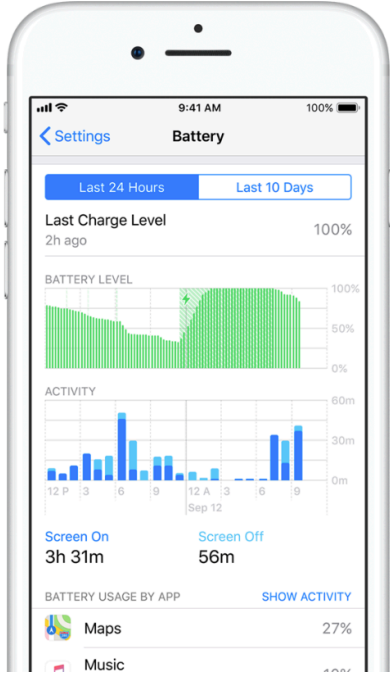
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models¹
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display²
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon  and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



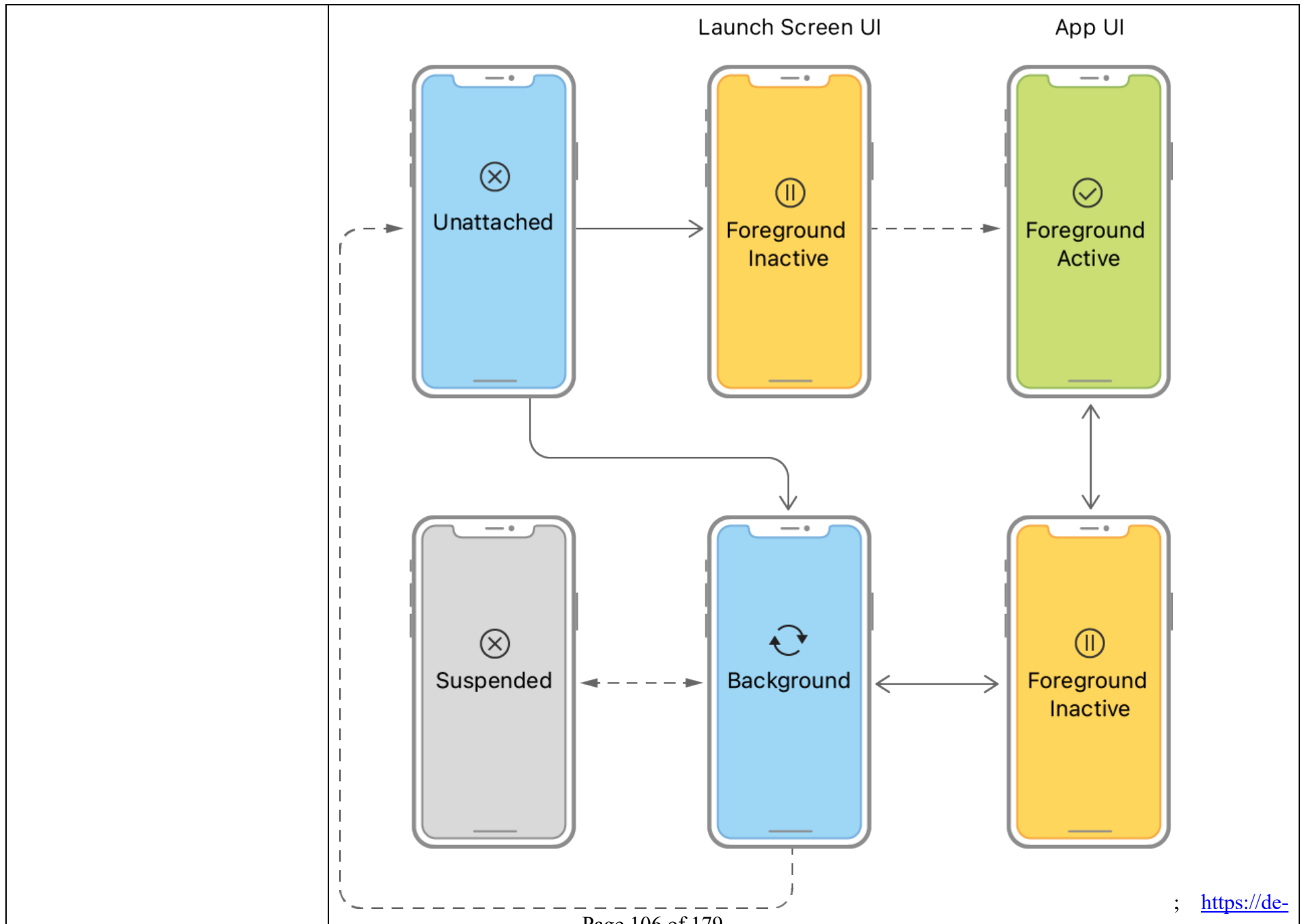
1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	<p>https://www.apple.com/batteries/maximizing-performance/:</p> <h2>View Battery Usage information</h2> <p>With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.</p> <p>Here are the messages you may see listed below the apps you've been using:</p> <p>Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.</p> <ul style="list-style-type: none">• To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely.• If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  <p>; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate:</p>

Claim	Public Documentation
	<div>Instance Property</div> <div>applicationState</div> <div>The app's current state, or that of its most active scene.</div> <div><div>iOS 4.0+</div><div>iPadOS 4.0+</div><div>Mac Catalyst 13.1+</div><div>tvOS 9.0+</div><div>visionOS 1.0+ Beta</div></div> <div><pre>var applicationState: UIApplication.State { get }</pre></div> <div>Discussion</div> <div>The behavior of this property depends on whether your app is scene-based.</div> <div>In a scene-based app, this property takes the value of the most active scene, which it determines from each scene's <code>activationState</code> property. A scene-based app launches in the background state, and transitions between its states as scenes connect, change their states, and disconnect. For scene-based apps, use <code>UISceneDelegate</code> to respond to changes in an individual scene's life cycle.</div> <div>In a sceneless app, the property's value is always the app's current state. The app is inactive at launch, and then is generally in either an active or background state. The app may become inactive for a short period — for example, when transitioning between active and background states, when the system presents an alert in front of it, or when the system displays the application switcher. For sceneless apps, use <code>UIApplicationDelegate</code> to respond to the app's life cycle changes.</div> <div>; https://developer.apple.com/documentation/uikit/app_and_environment/managing_your_app_s_life_cycle:</div>

Claim	Public Documentation
	<div data-bbox="590 240 1822 612"><h1 data-bbox="598 256 1703 337">Managing Your App's Life Cycle</h1><p data-bbox="598 370 1728 524">Respond to system notifications when your app is in the foreground or background, and handle other significant system-related events.</p></div> <div data-bbox="590 695 869 755"><h2 data-bbox="598 703 861 755">Overview</h2></div> <div data-bbox="590 797 1770 1084"><p data-bbox="598 800 1770 1084">The current state of your app determines what it can and cannot do at any time. For example, a foreground app has the user's attention, so it has priority over system resources, including the CPU. By contrast, a background app must do as little work as possible, and preferably nothing, because it is offscreen. As your app changes from state to state, you must adjust its behavior accordingly.</p></div>



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	<p data-bbox="588 243 1575 308">veloper.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/:</p> <div data-bbox="588 316 1822 479"><h2 data-bbox="598 321 1585 373">Preparing Your UI to Run in the Foreground</h2><p data-bbox="598 393 1066 425">Configure your app to appear onscreen.</p></div> <h3 data-bbox="598 539 777 576">Overview</h3> <p data-bbox="598 604 1806 727">Use foreground transitions to prepare your app's UI to appear onscreen. An app's transition to the foreground is usually in response to a user action. For example, when the user taps the app's icon, the system launches the app and brings it to the foreground. Use a foreground transition to update your app's UI, acquire resources, and start the services you need to handle user requests.</p>

Claim	Public Documentation
	<p>Configure Your User Interface and Initial Tasks at Activation</p> <p>The system moves your app to the active state immediately before displaying the app's UI. Activation is a good time to configure your app's UI and runtime behavior; specifically:</p> <ul style="list-style-type: none"> • Show your app's windows, if needed. • Change the currently visible view controller, if needed. • Update the data values and state of views and controls. • Display controls to resume a paused game. • Start or resume any dispatch queues that you use to execute tasks. • Update data source objects. • Start timers for periodic tasks. <p>Put your configuration code in one of the following methods:</p> <ul style="list-style-type: none"> • For a scene-based UI—The <code>sceneDidBecomeActive(_:)</code> method of the appropriate scene delegate object. • For all other apps—The <code>applicationDidBecomeActive(_:)</code> method of your app delegate object. <p>Activation is also the time to put finishing touches on your UI before displaying it to the user. Don't run any code that might block your activation method. Instead, make sure you have everything you need in advance. For example, if your data changes frequently outside of the app, use background tasks to fetch updates from the network before your app returns to the foreground. Otherwise, be prepared to display existing data while you fetch changes asynchronously.</p> <p>https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/</p>

Claim	Public Documentation
	<p> ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks/bgappprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate/; https://developer.apple.com/documentation/uikit/uiapplication/state/; https://developer.apple.com/documentation/foundation/url_loading_system/; https://developer.apple.com/documentation/foundation/urlsession/; https://developer.apple.com/documentation/avfoundation/avplayer/; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback/; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063/; </p>

Claim	Public Documentation
	<div data-bbox="585 238 1820 933"><h3>Factors affecting your runtime</h3><div>Critically low battery Background App Refresh switch Airplane mode</div><div>Low Power Mode Ongoing iCloud restore Settings Display on/off state</div><div>Device temperature System budgets Process contention App usage</div><div>App switcher Rate limiting Camera in-use Device lock state</div><div data-bbox="1089 886 1316 922"><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>02:1017:08</div></div></div>

Top factors



Critically low battery



Low Power Mode



App usage



App switcher



Background App Refresh switch








System budgets

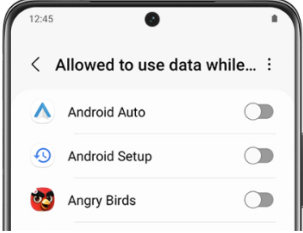


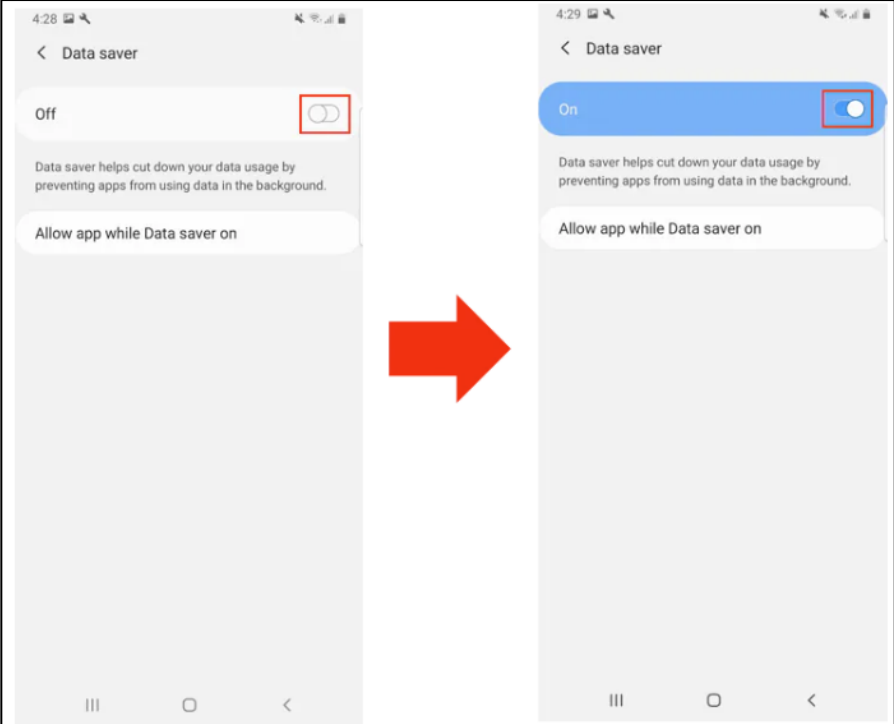
Rate limiting

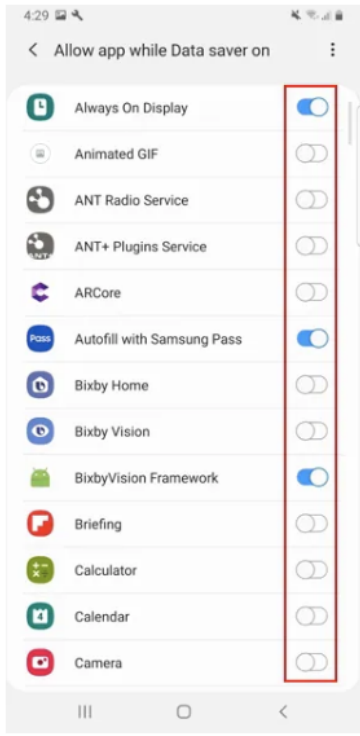


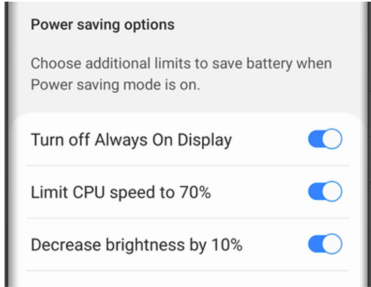
Claim	Public Documentation
	 <p>The image shows three Apple Watch screens side-by-side. The first screen is the 'Settings' app, showing options for General, Do Not Disturb, and Airplane Mode. The second screen is the 'General' settings page, showing options for Software Update, Orientation, Background App Refresh, and Wake Screen. The third screen is the 'Background App Refresh' settings page, showing a toggle switch for 'Background App Refresh' which is currently turned off. Below the toggle, there is explanatory text about how turning off this feature may preserve battery life and that apps with complications will continue to refresh even when background app refresh is off.</p>
<p>[1j] is interacting with the user in the device user interface foreground, and</p>	<p>The Accused Instrumentalities comprise one or more applications “interacting with the user in the device user interface foreground.”</p> <p>For example, phones and tablets sold and used by Verizon classify applications and internet service activities in both foreground and background. <i>See, e.g.,</i> https://www.verizon.com/support/knowledge-base-236117/:</p>


Claim	Public Documentation
	<div data-bbox="617 266 1566 380">Samsung Galaxy S21 5G / Galaxy S21 Ultra 5G - Manage Data Usage</div> <div data-bbox="653 467 722 493">NOTE</div> <div data-bbox="684 516 1520 688"><ul style="list-style-type: none">• Data usage info provided by the device may differ from actual usage. For data usage info provided by Verizon, refer to the My Verizon website.•  For a better understanding of how data is used, check out this video.• To control data usage on your account, refer to Verizon Smart Family™.</div> <div data-bbox="621 786 1457 1094"><ol style="list-style-type: none">1. From a Home screen, swipe up from the center of the display to access the apps screen. → These instructions only apply to Standard mode and the default Home screen layout.2. Navigate: Settings  > Connections.3. Tap Data usage then do any of the following:<ul style="list-style-type: none">• Turn Data saver off<ol style="list-style-type: none">a. Tap Data saver.b. Tap the Data saver switch to turn on  or off  . → Data saver must be turned off to use Mobile Hotspot.</div> <div data-bbox="590 1143 1398 1179">; https://www.samsung.com/us/support/answer/ANS00079018/:</div>

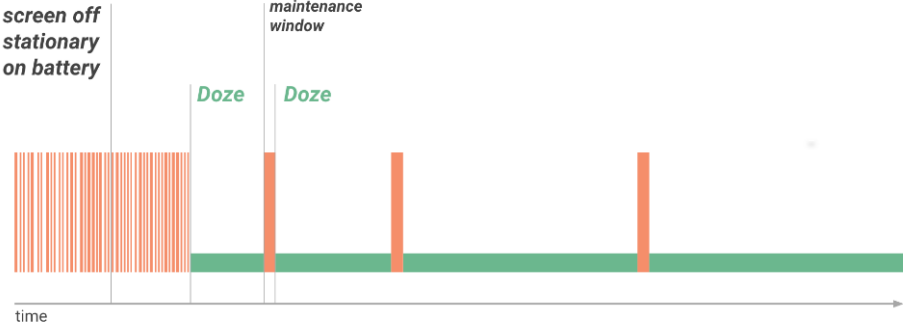
Claim	Public Documentation
	<div data-bbox="598 250 1602 756"><p>Turn Data saver on or off ✓</p><p>Data saver prevents some apps from sending or receiving data in the background. So rest assured, you're not wasting any precious data.</p><ol style="list-style-type: none">1. Navigate to and open Settings, and then tap Connections.2. Tap Data usage, tap Data saver, and then tap the switch next to Turn on now.3. If there are still some apps you'd like to run in the background, you can set them as exceptions. Tap Allowed to use data while Data saver is on at the bottom of the screen.4. Tap More options (the three vertical dots) and choose Show system apps or Show allowed apps first to narrow down the list.5. Finally, tap the switch(es) next to your desired app(s).</div> <p data-bbox="588 776 1856 808">; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:</p>

Claim	Public Documentation
	

Claim	Public Documentation
	<p data-bbox="604 261 1432 310">6 Toggle the switches on next to the apps that you need to receive notifications from all the time. Email, Messages, Messenger, Instagram and Facebook are all popular options to allow unrestricted data access..</p>  <p data-bbox="583 1076 1402 1109">; https://www.samsung.com/us/support/answer/ANS00078987/:</p>

Claim	Public Documentation
	<div data-bbox="594 245 1829 862"> <h3>Power saving mode ✓</h3> <p>Note: Using Power saving mode can affect app and device performance. Some tasks and features may take longer to complete or update. Additionally, apps running in the background may not receive updates or send you notifications when Power saving mode is enabled.</p> <p>Before you turn in for the night, change your phone's power mode. This will decrease your phone's performance and save battery life.</p> <ol style="list-style-type: none"> 1. Navigate to and open Settings, and then tap Battery and device care. 2. Tap Battery, and then tap Power saving. 3. Tap the switches next to your desired settings or customizations. 4. Finally, tap the switch at the top of the screen to activate Power saving mode. <p>You will not be able to adjust the settings once the mode is enabled. If you want to change any of the settings, you'll need to temporarily disable Power saving mode.</p>  <p>The screenshot shows a 'Power saving options' menu with three toggle switches, all of which are turned on. The options are: 'Turn off Always On Display', 'Limit CPU speed to 70%', and 'Decrease brightness by 10%'.</p> </div> <p>; https://developer.android.com/training/basics/network-ops/data-saver:</p> <div data-bbox="594 958 1619 1390"> <h3>Optimize network data usage 🔖</h3> <p>Over the life of a smartphone, the cost of a cellular data plan can easily exceed the cost of the device itself. On Android 7.0 (API level 24) and higher, users can enable Data Saver on a device-wide basis in order to optimize their device's data usage, and use less data. This ability is especially useful when roaming, near the end of the billing cycle, or for a small prepaid data pack.</p> <p>When a user enables Data Saver in Settings and the device is on a metered network, the system blocks background data usage and signals apps to use less data in the foreground wherever possible. Users can allow specific apps to use background metered data usage even when Data Saver is turned on.</p> <p>Android 7.0 (API level 24) extends the <code>ConnectivityManager</code> API to provide apps with a way to retrieve the user's Data Saver preferences and monitor preference changes. It is considered good practice for apps to check whether the user has enabled Data Saver and make an effort to limit foreground and background data usage.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1577 797"> <h3>Check data saver preferences</h3> <p>On Android 7.0 (API level 24) and higher, apps can use the <code>ConnectivityManager</code> API to determine what data usage restrictions are being applied. The <code>getRestrictBackgroundStatus()</code> method returns one of the following values:</p> <p><code>RESTRICT_BACKGROUND_STATUS_DISABLED</code></p> <p>Data Saver is disabled.</p> <p><code>RESTRICT_BACKGROUND_STATUS_ENABLED</code></p> <p>The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.</p> <p><code>RESTRICT_BACKGROUND_STATUS_WHITELISTED</code></p> <p>The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.</p> <p>Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses <code>ConnectivityManager.isActiveNetworkMetered()</code> and <code>ConnectivityManager.getRestrictBackgroundStatus()</code> to determine how much data the app should use:</p> </div> <p data-bbox="594 816 1593 849">; https://developer.android.com/training/monitoring-device-state/doze-standby;</p> <div data-bbox="594 857 1829 1356"> <h2>Optimize for Doze and App Standby </h2> <p>Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. <i>Doze</i> reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. <i>App Standby</i> defers background network activity for apps with which the user has not recently interacted.</p> <p>While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.</p> <p>Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1545 870"> <h3>Understanding Doze</h3> <p>If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms.</p> <p>Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this <i>maintenance window</i>, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.</p>  <p>Figure 1. Doze provides a recurring maintenance window for apps to use the network and handle pending activities.</p> </div> <div data-bbox="594 894 1646 1065"> <p>At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger.</p> <p>As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity.</p> </div> <div data-bbox="594 1089 1829 1219"> <p>The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible.</p> </div> <p>; https://developer.android.com/topic/performance/appstandby:</p>

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

★ **Note:** Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

1. **Active:** App is currently being used or was very recently used.
2. **Working set:** App is in regular use.
3. **Frequent:** App is often used, but not every day.
4. **Rare:** App is not frequently used.
5. **Restricted:** App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

Claim	Public Documentation
	<p> https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/process-lifecycle; </p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>1. A foreground process is one that is required for what the user is currently doing. Various application components can cause its containing process to be considered foreground in different ways. A process is considered to be in the foreground if any of the following conditions hold:</p> <ul style="list-style-type: none"> • It is running an Activity at the top of the screen that the user is interacting with (its onResume() method has been called). • It has a BroadcastReceiver that is currently running (its BroadcastReceiver.onReceive() method is executing). • It has a Service that is currently executing code in one of its callbacks (Service.onCreate(), Service.onStart(), or Service.onDestroy()). <p>There will only ever be a few such processes in the system, and these will only be killed as a last resort if memory is so low that not even these processes can continue to run. Generally, at this point, the device has reached a memory paging state, so this action is required in order to keep the user interface responsive.</p> </div> <p> ; https://developer.android.com/guide/background; </p>

Claim	Public Documentation
	<div data-bbox="594 245 1831 631">Definition of background work<p>An app is running in the <i>background</i> when both the following conditions are satisfied:</p><ul style="list-style-type: none">• None of the app's activities are currently visible to the user.• The app isn't running any foreground services that started while an activity from the app was visible to the user.<p>Otherwise, the app is running in the <i>foreground</i>.</p></div> <p data-bbox="594 651 1346 683">; https://developer.android.com/guide/components/services;</p>

Types of Services

These are the three different types of services:

Foreground

A foreground service performs some operation that is noticeable to the user. For example, an audio app would use a foreground service to play an audio track. Foreground services must display a [Notification](#). Foreground services continue running even when the user isn't interacting with the app.

When you use a foreground service, you must display a notification so that users are actively aware that the service is running. This notification cannot be dismissed unless the service is either stopped or removed from the foreground.

Learn more about how to configure [foreground services](#) in your app.

★ **Note:** The [WorkManager](#) API offers a flexible way of scheduling tasks, and is able to [run these jobs as foreground services](#) if needed. In many cases, using WorkManager is preferable to using foreground services directly.

Background

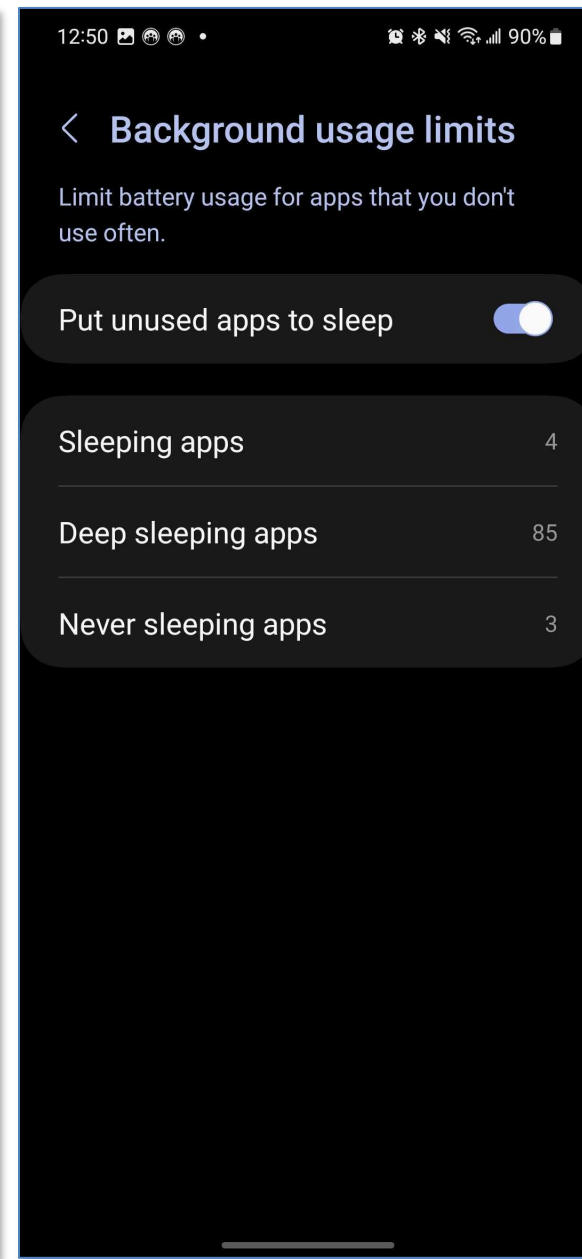
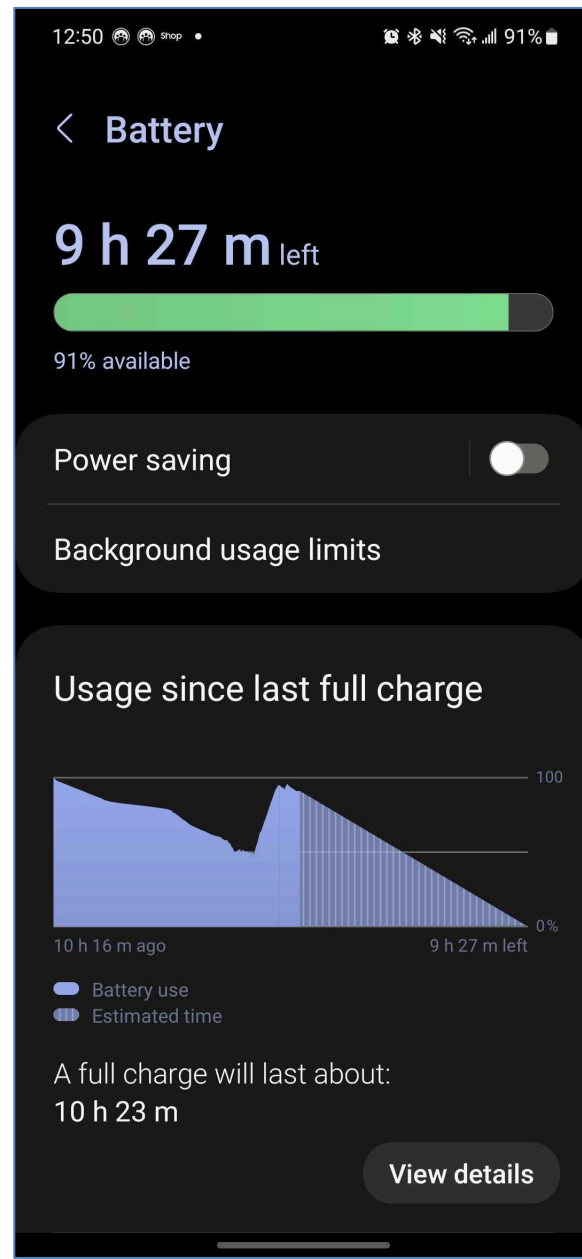
A background service performs an operation that isn't directly noticed by the user. For example, if an app used a service to compact its storage, that would usually be a background service.

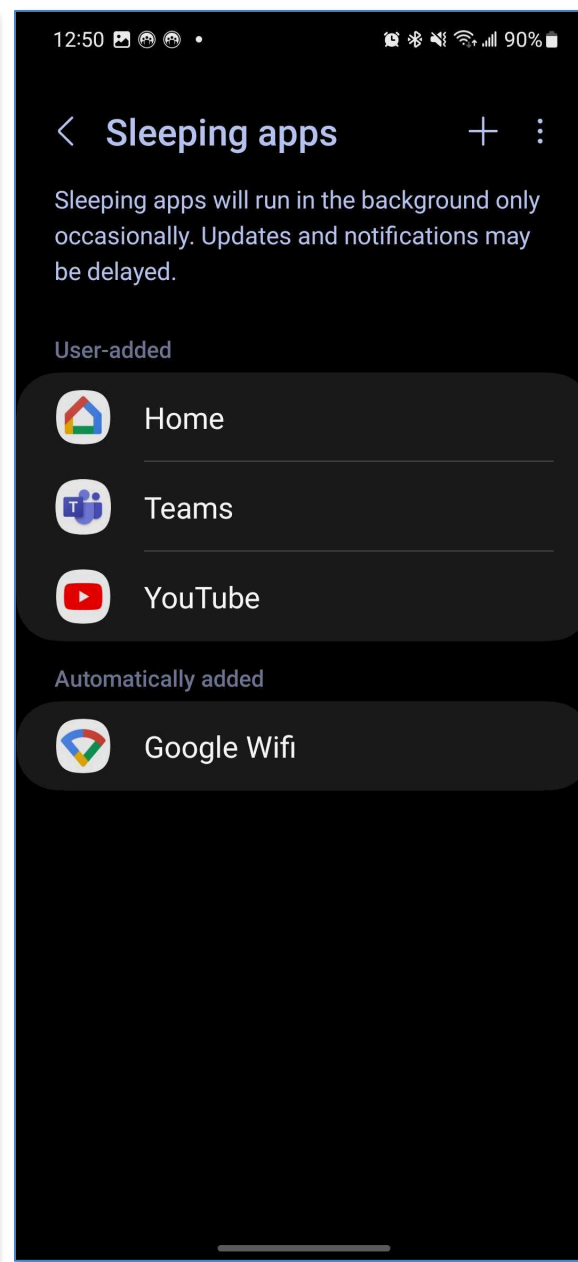
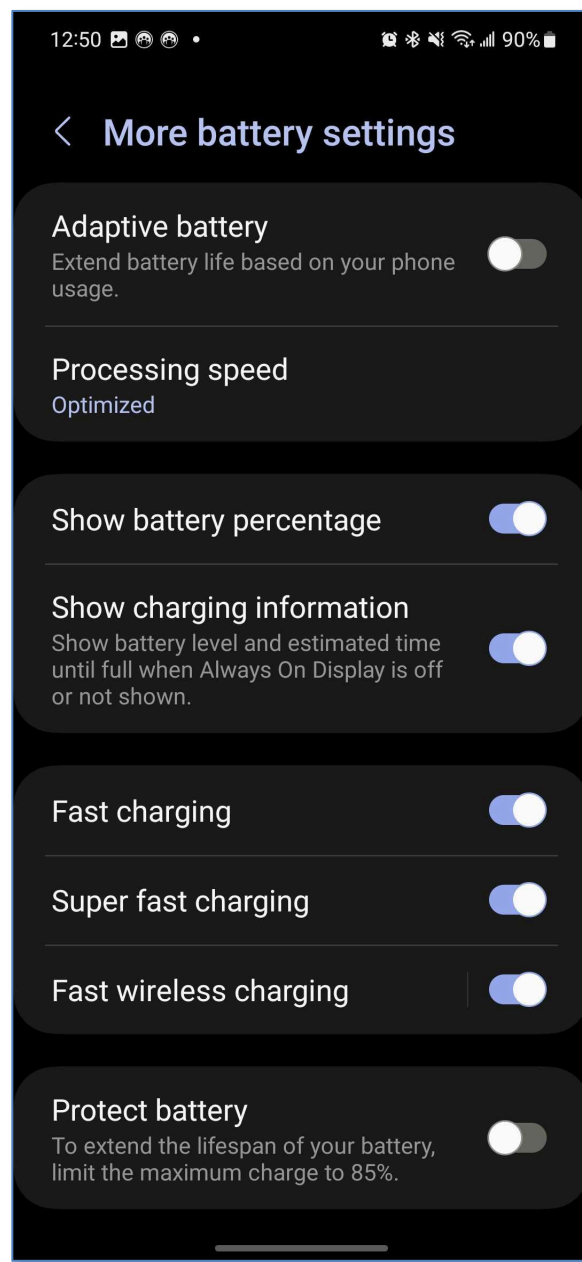
★ **Note:** If your app targets API level 26 or higher, the system imposes [restrictions on running background services](#) when the app itself isn't in the foreground. In most situations, for example, you shouldn't [access location information from the background](#). Instead, [schedule tasks using WorkManager](#).

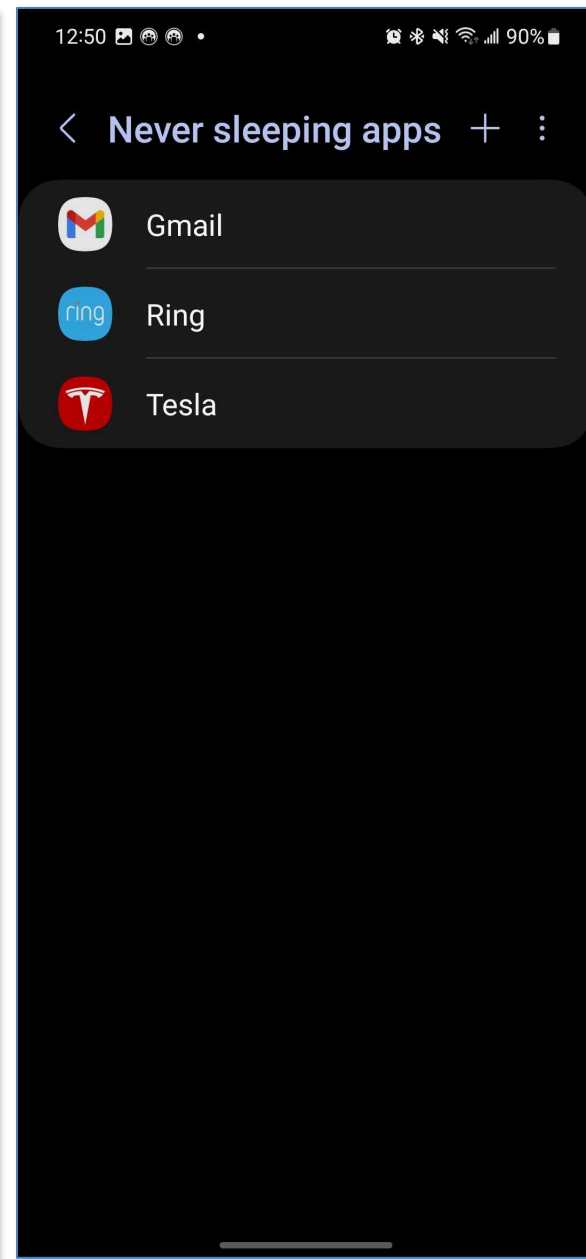
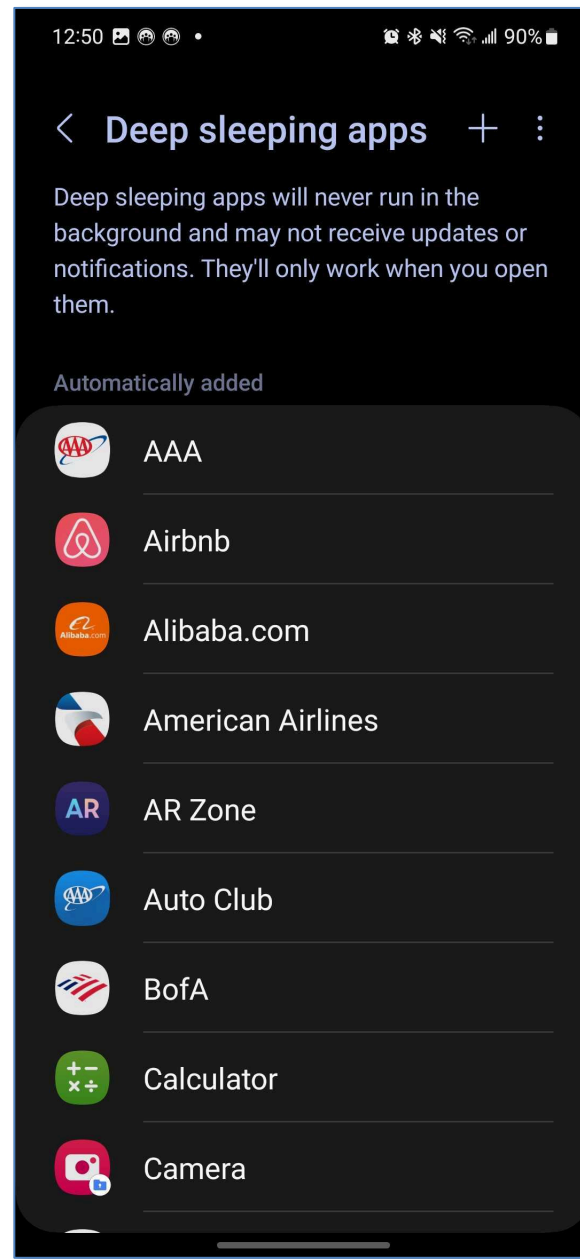
Bound

A service is *bound* when an application component binds to it by calling `bindService()`. A bound service offers a client-server interface that allows components to interact with the service, send requests, receive results, and even do so across processes with interprocess communication (IPC). A bound service runs only as long as another application component is bound to it. Multiple components can bind to the service at once, but when all of them unbind, the service is destroyed.





Claim	Public Documentation
	; https://developer.android.com/guide/components/activities/intro-activities ; <i>see also</i> the exemplary screen-shots below:

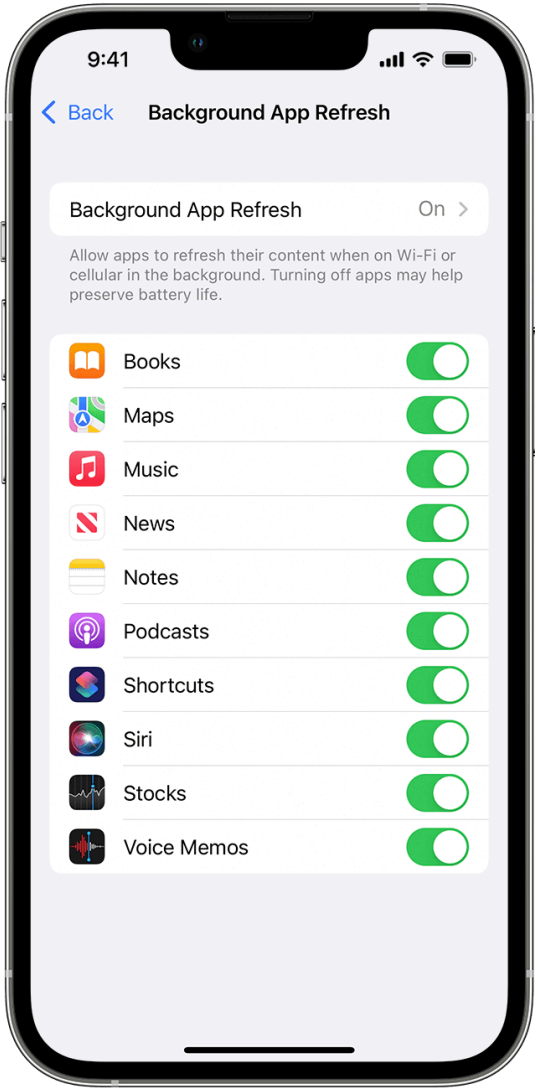






Claim	Public Documentation
	<p data-bbox="583 245 1423 277"><i>See also, e.g.,</i> https://www.verizon.com/support/data-usage-faqs/:</p> <div data-bbox="625 378 1942 418"><p data-bbox="625 378 1312 418">What is indirect or background data usage? ^</p></div> <p data-bbox="625 477 1875 545">Indirect data usage occurs in the background, during tasks performed automatically by your device. Some examples of indirect data usage are:</p> <ul data-bbox="615 586 1197 841" style="list-style-type: none"><li data-bbox="615 586 1197 618">• Automatic backups of pictures or videos<li data-bbox="615 659 917 691">• Software updates<li data-bbox="615 732 974 764">• App content refreshes<li data-bbox="615 805 1066 841">• Syncing and location services <p data-bbox="625 881 1383 914">Note: You can adjust these functions in your device Settings.</p> <p data-bbox="583 971 1371 1003">; https://www.verizon.com/support/knowledge-base-207174/:</p>

Claim	Public Documentation
	<div data-bbox="583 240 1963 412"><div>Personal Business</div><div>Stores Español</div><div>Shop Why Verizon Support</div><div>Sign in  Search </div><div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div></div> <div data-bbox="604 435 840 451">Support > Apple > Apple iPhone 7 Plus</div> <div data-bbox="625 492 1381 578"><h2>Apple iPhone - Turn Background App Refresh On / Off</h2></div> <div data-bbox="653 656 705 672">NOTE</div> <div data-bbox="653 680 1337 725"><p>When Background App Refresh is turned on, apps that take advantage of this feature can refresh themselves in the background. For additional info, refer to multitasking and background app refresh.</p></div> <div data-bbox="627 786 1251 1002"><ol style="list-style-type: none">1. From a Home screen on your Settings  General. → If an app isn't available on your Home screen, swipe left to access the App Library.2. Tap Background App Refresh twice then tap one of the following: → When low power mode is on, the background app refresh is disabled.<ul style="list-style-type: none">• Off• Wi-Fi• Wi-Fi and Cellular Data</div> <div data-bbox="583 1031 1144 1063"><p>https://support.apple.com/en-us/HT202070:</p></div>

Claim	Public Documentation
	<div data-bbox="606 305 1297 363"><h2>Use Background App Refresh</h2></div> <div data-bbox="606 391 1377 638"><p>After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content.</p></div> <div data-bbox="606 672 1373 878"><p>If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again.</p></div> <div data-bbox="588 1377 1144 1412"><p>https://support.apple.com/en-us/HT205234:</p></div> <div data-bbox="1436 261 1967 1343"></div>

Use Low Power Mode to save battery life on your iPhone or iPad


Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

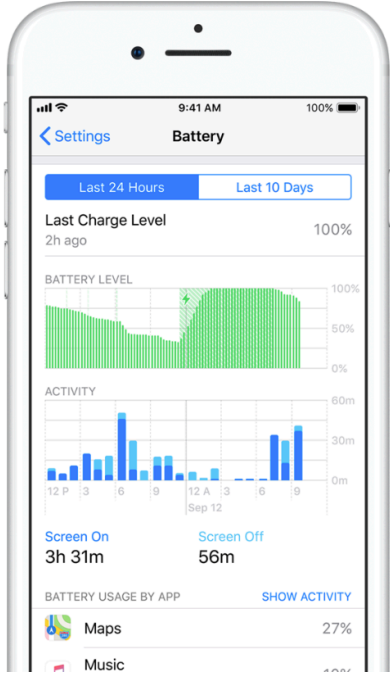
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models¹
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display²
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon  and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	<p>https://www.apple.com/batteries/maximizing-performance/:</p> <h2>View Battery Usage information</h2> <p>With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.</p> <p>Here are the messages you may see listed below the apps you've been using:</p> <p>Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.</p> <ul style="list-style-type: none">• To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely.• If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  <p>; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate:</p>

Claim	Public Documentation
	<div>Instance Property</div> <div>applicationState</div> <div>The app's current state, or that of its most active scene.</div> <div><div>iOS 4.0+</div><div>iPadOS 4.0+</div><div>Mac Catalyst 13.1+</div><div>tvOS 9.0+</div><div>visionOS 1.0+ Beta</div></div> <div><pre>var applicationState: UIApplication.State { get }</pre></div> <div>Discussion</div> <div>The behavior of this property depends on whether your app is scene-based.</div> <div>In a scene-based app, this property takes the value of the most active scene, which it determines from each scene's <code>activationState</code> property. A scene-based app launches in the background state, and transitions between its states as scenes connect, change their states, and disconnect. For scene-based apps, use <code>UISceneDelegate</code> to respond to changes in an individual scene's life cycle.</div> <div>In a sceneless app, the property's value is always the app's current state. The app is inactive at launch, and then is generally in either an active or background state. The app may become inactive for a short period — for example, when transitioning between active and background states, when the system presents an alert in front of it, or when the system displays the application switcher. For sceneless apps, use <code>UIApplicationDelegate</code> to respond to the app's life cycle changes.</div> <div><pre>;</pre><pre>https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/;</pre></div>

Claim	Public Documentation
	<p> https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063; </p>

Claim	Public Documentation
	<div data-bbox="585 238 1822 933"><h3>Factors affecting your runtime</h3><div>Critically low battery Background App Refresh switch Airplane mode</div><div>Low Power Mode Ongoing iCloud restore Settings Display on/off state</div><div>Device temperature System budgets Process contention App usage</div><div>App switcher Rate limiting Camera in-use Device lock state</div><div data-bbox="1089 886 1316 922"><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>02:1017:08</div></div></div>

Top factors



Critically low battery



Low Power Mode



App usage



App switcher



Background App Refresh switch








System budgets

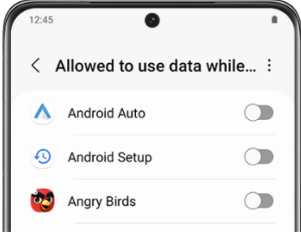


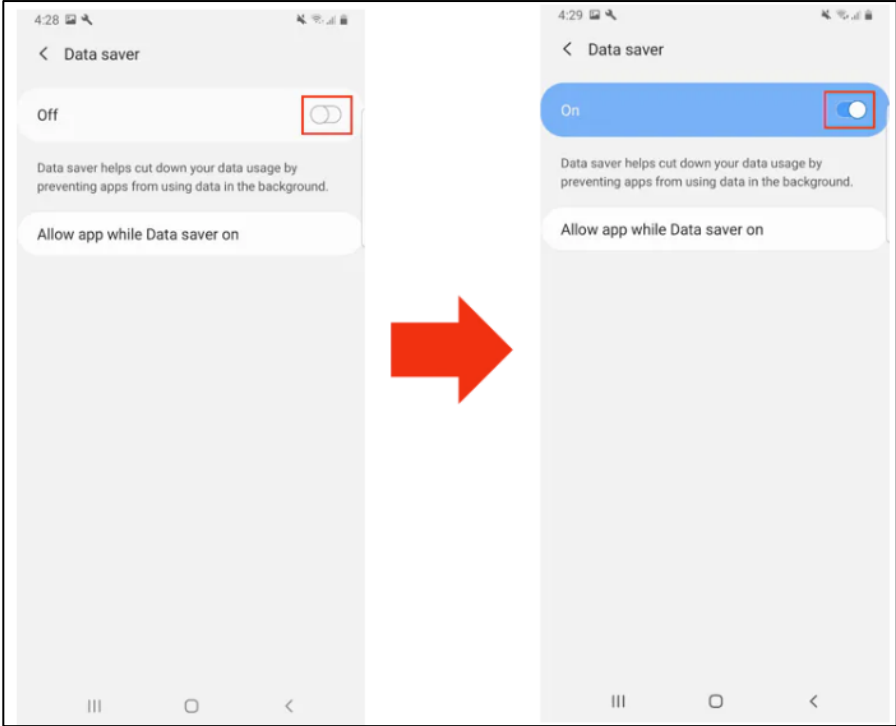
Rate limiting

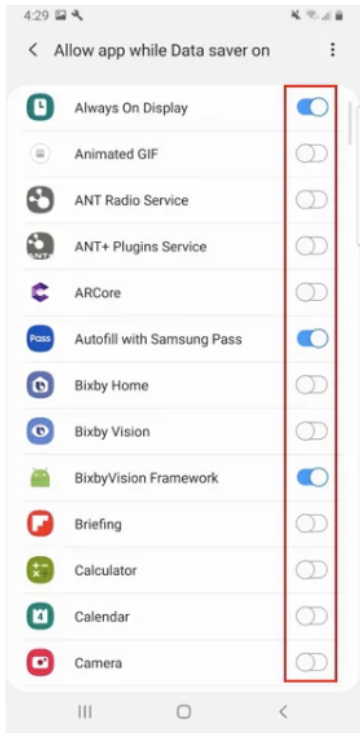


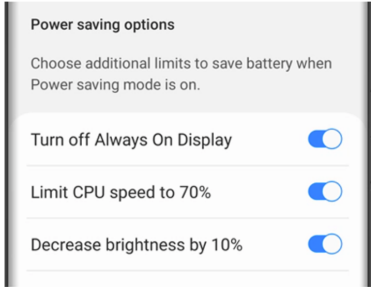
Claim	Public Documentation
	 <p>The image shows three Apple Watch screens side-by-side. The first screen is the 'Settings' menu, showing options for General, Do Not Disturb, and Airplane Mode. The second screen is the 'General' settings menu, showing options for Software Update, Orientation, Background App Refresh, and Wake Screen. The third screen is the 'Background App Refresh' settings menu, showing a toggle switch for 'Background App Refresh' which is currently turned off. Below the toggle, there is a warning message: 'Turning off Background App Refresh may preserve battery life. Apps with complications on the current watch face will continue to refresh, even when their background app refresh setting is off.'</p>
<p>[1k] selectively allow or deny one or more Internet service activities by or on behalf of the particular application based on whether or not the particular application is one of the first one or more applications, the differential traffic control policy, including any applicable user augmentation of the differential traffic control policy, and the classifications performed by the one or more processors.</p>	<p>The Accused Instrumentalities “selectively allow or deny one or more Internet service activities by or on behalf of the particular application based on whether or not the particular application is one of the first one or more applications, the differential traffic control policy, including any applicable user augmentation of the differential traffic control policy, and the classifications performed by the one or more processors.”</p> <p>For example, phones and tablets sold and used by Verizon allow or deny internet service activities by or on behalf of applications based on classifications of particular applications and policies.. <i>See, e.g.,</i> https://www.verizon.com/support/knowledge-base-236117/:</p>


Claim	Public Documentation
	<div data-bbox="617 266 1566 380"><h2>Samsung Galaxy S21 5G / Galaxy S21 Ultra 5G - Manage Data Usage</h2></div> <div data-bbox="653 467 722 493"><p>NOTE</p></div> <div data-bbox="684 516 1520 688"><ul style="list-style-type: none">• Data usage info provided by the device may differ from actual usage. For data usage info provided by Verizon, refer to the My Verizon website.•  For a better understanding of how data is used, check out this video.• To control data usage on your account, refer to Verizon Smart Family™.</div> <div data-bbox="621 786 1457 1094"><ol style="list-style-type: none">1. From a Home screen, swipe up from the center of the display to access the apps screen. → These instructions only apply to Standard mode and the default Home screen layout.2. Navigate: Settings  Connections.3. Tap Data usage then do any of the following:<ul style="list-style-type: none">• Turn Data saver off<ol style="list-style-type: none">a. Tap Data saver.b. Tap the Data saver switch to turn on  or off . → Data saver must be turned off to use Mobile Hotspot.</div> <div data-bbox="590 1143 1398 1179"><p>; https://www.samsung.com/us/support/answer/ANS00079018/:</p></div>

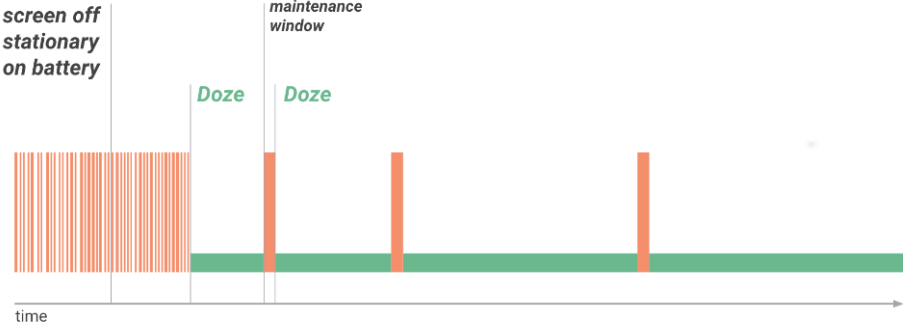
Claim	Public Documentation
	<div data-bbox="598 250 1602 756"><p>Turn Data saver on or off ✓</p><p>Data saver prevents some apps from sending or receiving data in the background. So rest assured, you're not wasting any precious data.</p><ol style="list-style-type: none">1. Navigate to and open Settings, and then tap Connections.2. Tap Data usage, tap Data saver, and then tap the switch next to Turn on now.3. If there are still some apps you'd like to run in the background, you can set them as exceptions. Tap Allowed to use data while Data saver is on at the bottom of the screen.4. Tap More options (the three vertical dots) and choose Show system apps or Show allowed apps first to narrow down the list.5. Finally, tap the switch(es) next to your desired app(s).</div> <p data-bbox="588 776 1856 808">; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:</p>

Claim	Public Documentation
	

Claim	Public Documentation
	<p data-bbox="604 261 1430 310">6 Toggle the switches on next to the apps that you need to receive notifications from all the time. Email, Messages, Messenger, Instagram and Facebook are all popular options to allow unrestricted data access..</p>  <p data-bbox="583 1076 1402 1109">; https://www.samsung.com/us/support/answer/ANS00078987/:</p>

Claim	Public Documentation
	<div data-bbox="594 245 1829 862"> <h3>Power saving mode ✓</h3> <p>Note: Using Power saving mode can affect app and device performance. Some tasks and features may take longer to complete or update. Additionally, apps running in the background may not receive updates or send you notifications when Power saving mode is enabled.</p> <p>Before you turn in for the night, change your phone's power mode. This will decrease your phone's performance and save battery life.</p> <ol style="list-style-type: none"> 1. Navigate to and open Settings, and then tap Battery and device care. 2. Tap Battery, and then tap Power saving. 3. Tap the switches next to your desired settings or customizations. 4. Finally, tap the switch at the top of the screen to activate Power saving mode. <p>You will not be able to adjust the settings once the mode is enabled. If you want to change any of the settings, you'll need to temporarily disable Power saving mode.</p>  <p>The screenshot shows a 'Power saving options' menu with three toggle switches, all of which are turned on. The options are: 'Turn off Always On Display', 'Limit CPU speed to 70%', and 'Decrease brightness by 10%'.</p> </div> <p>; https://developer.android.com/training/basics/network-ops/data-saver:</p> <div data-bbox="594 958 1619 1390"> <h3>Optimize network data usage 🔖</h3> <p>Over the life of a smartphone, the cost of a cellular data plan can easily exceed the cost of the device itself. On Android 7.0 (API level 24) and higher, users can enable Data Saver on a device-wide basis in order to optimize their device's data usage, and use less data. This ability is especially useful when roaming, near the end of the billing cycle, or for a small prepaid data pack.</p> <p>When a user enables Data Saver in Settings and the device is on a metered network, the system blocks background data usage and signals apps to use less data in the foreground wherever possible. Users can allow specific apps to use background metered data usage even when Data Saver is turned on.</p> <p>Android 7.0 (API level 24) extends the <code>ConnectivityManager</code> API to provide apps with a way to retrieve the user's Data Saver preferences and monitor preference changes. It is considered good practice for apps to check whether the user has enabled Data Saver and make an effort to limit foreground and background data usage.</p> </div>

Claim	Public Documentation
	<div data-bbox="594 245 1579 800"><h3>Check data saver preferences</h3><p>On Android 7.0 (API level 24) and higher, apps can use the <code>ConnectivityManager</code> API to determine what data usage restrictions are being applied. The <code>getRestrictBackgroundStatus()</code> method returns one of the following values:</p><div data-bbox="615 380 957 402"><code>RESTRICT_BACKGROUND_STATUS_DISABLED</code></div><p>Data Saver is disabled.</p><div data-bbox="615 470 947 492"><code>RESTRICT_BACKGROUND_STATUS_ENABLED</code></div><p>The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.</p><div data-bbox="615 586 984 607"><code>RESTRICT_BACKGROUND_STATUS_WHITELISTED</code></div><p>The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.</p><p>Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses <code>ConnectivityManager.isActiveNetworkMetered()</code> and <code>ConnectivityManager.getRestrictBackgroundStatus()</code> to determine how much data the app should use:</p></div> <p data-bbox="594 857 1593 886">; https://developer.android.com/training/monitoring-device-state/doze-standby;</p> <div data-bbox="594 894 1831 1393"><h2>Optimize for Doze and App Standby </h2><p>Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. <i>Doze</i> reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. <i>App Standby</i> defers background network activity for apps with which the user has not recently interacted.</p><p>While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.</p><p>Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.</p></div>

Claim	Public Documentation
	<div data-bbox="594 245 1545 870"> <h3>Understanding Doze</h3> <p>If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms.</p> <p>Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this <i>maintenance window</i>, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.</p>  <p>Figure 1. Doze provides a recurring maintenance window for apps to use the network and handle pending activities.</p> </div> <div data-bbox="594 894 1646 1065"> <p>At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger.</p> <p>As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity.</p> </div> <div data-bbox="594 1089 1829 1219"> <p>The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible.</p> </div> <p>; https://developer.android.com/topic/performance/appstandby:</p>

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

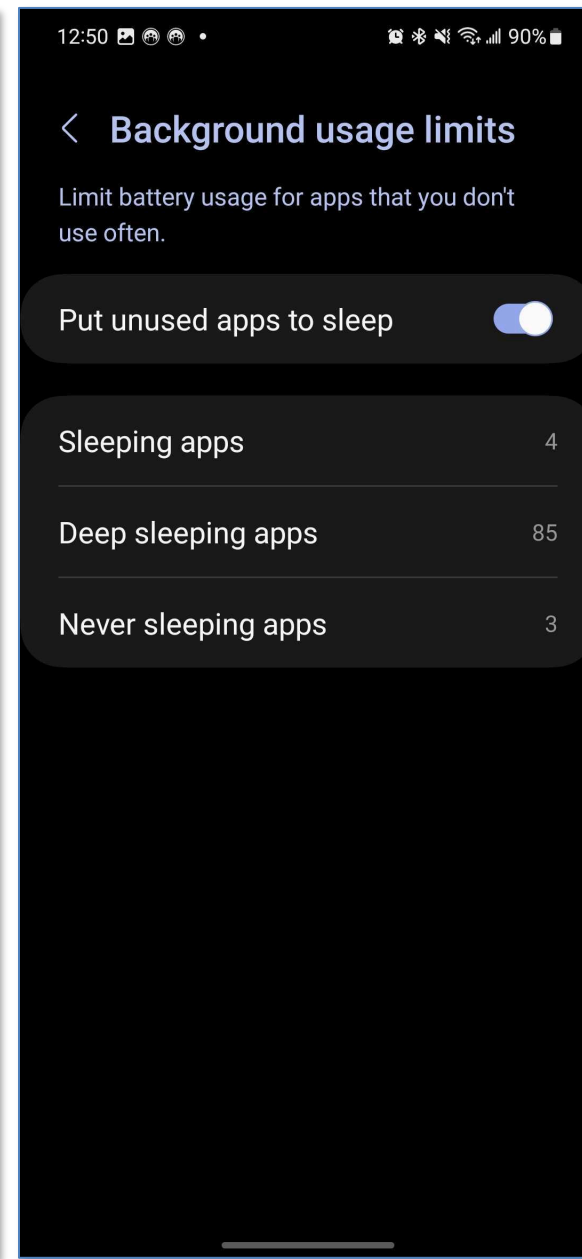
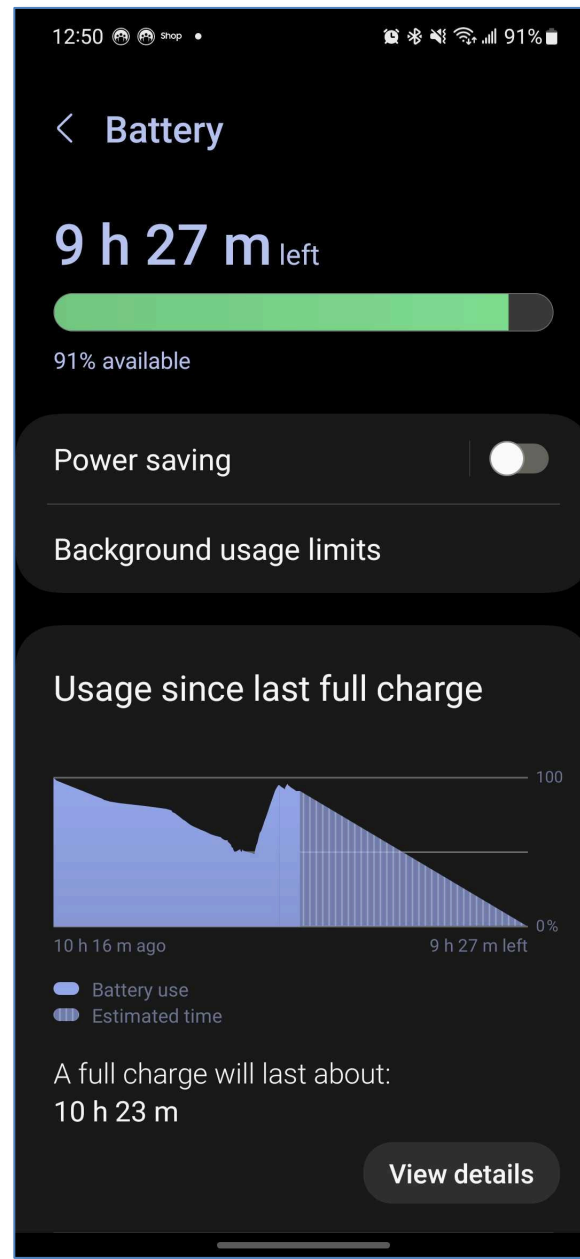
★ **Note:** Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

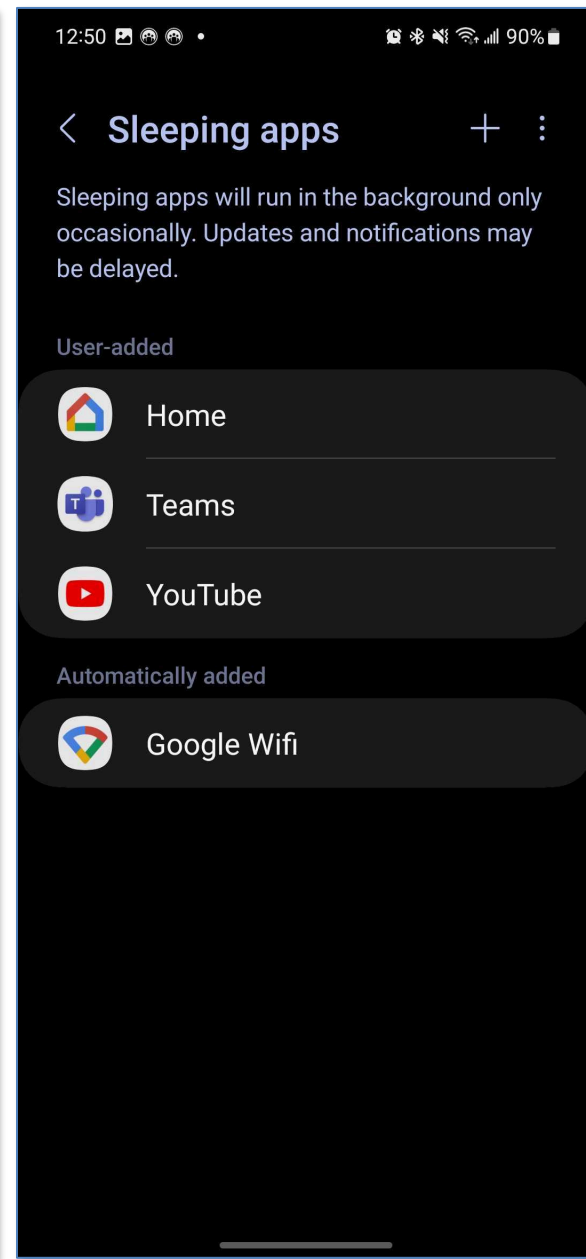
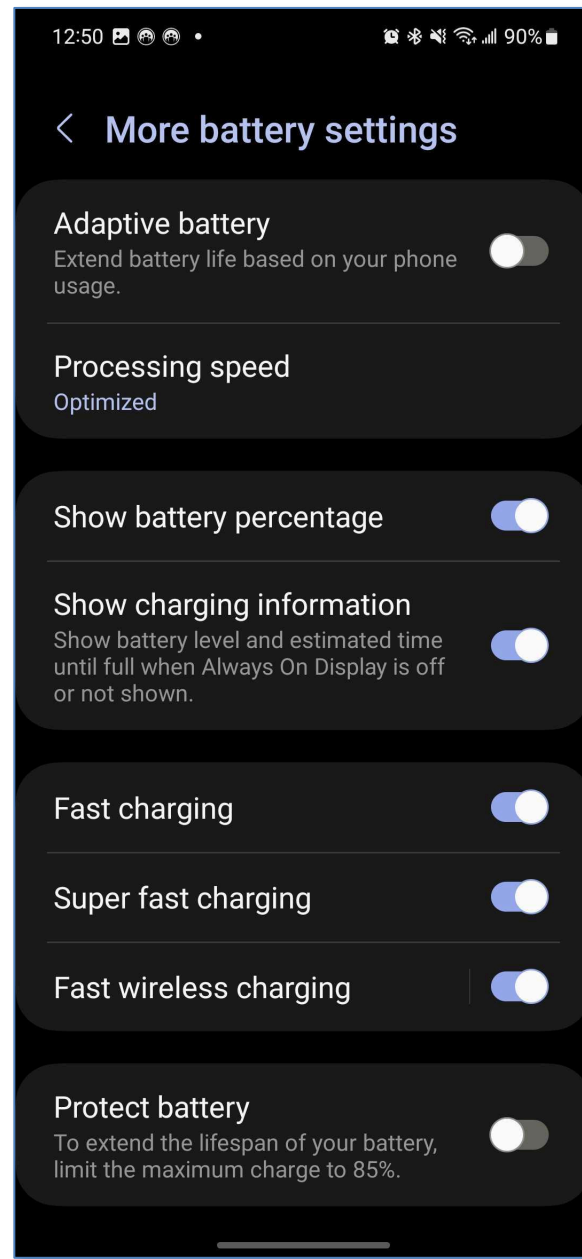
The buckets are:

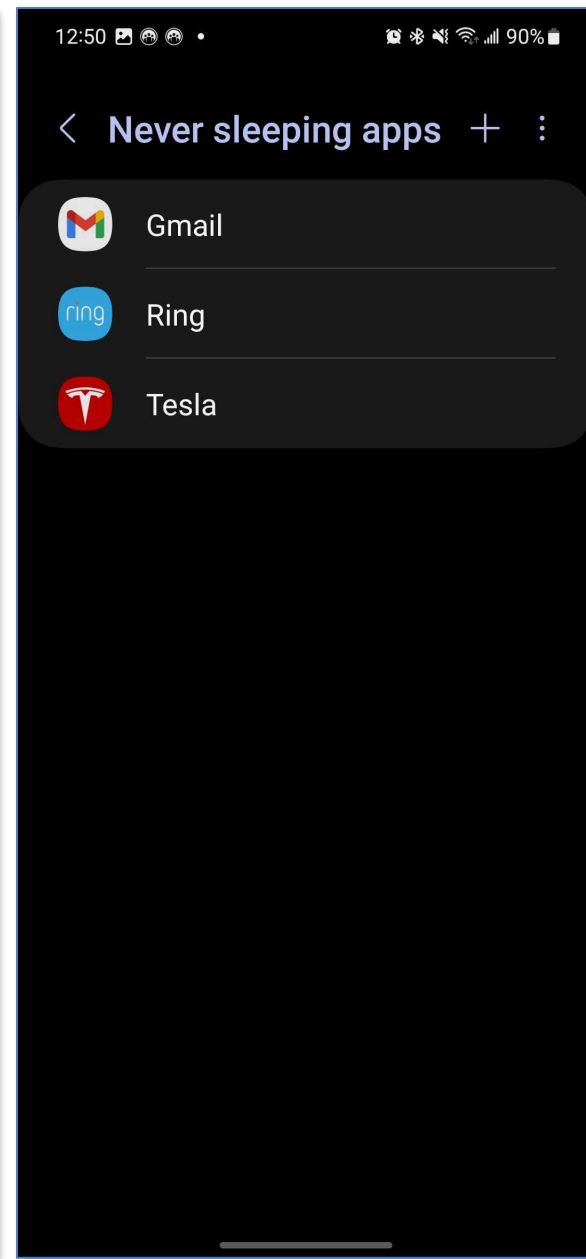
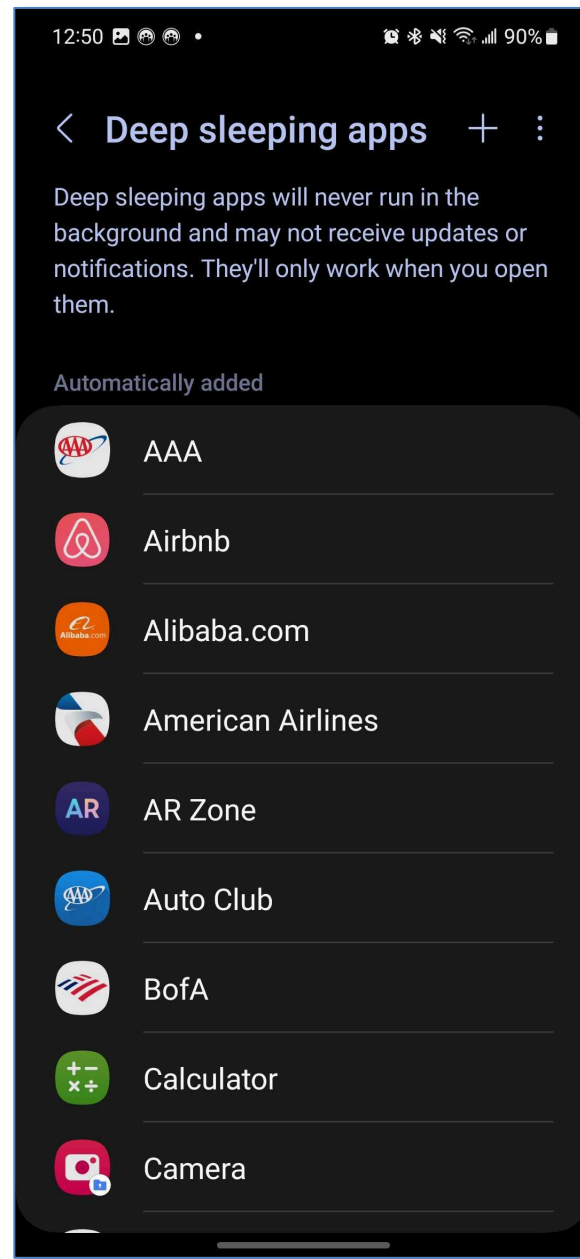
1. **Active:** App is currently being used or was very recently used.
2. **Working set:** App is in regular use.
3. **Frequent:** App is often used, but not every day.
4. **Rare:** App is not frequently used.
5. **Restricted:** App consumes a great deal of system resources, or may exhibit undesirable behavior.





In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

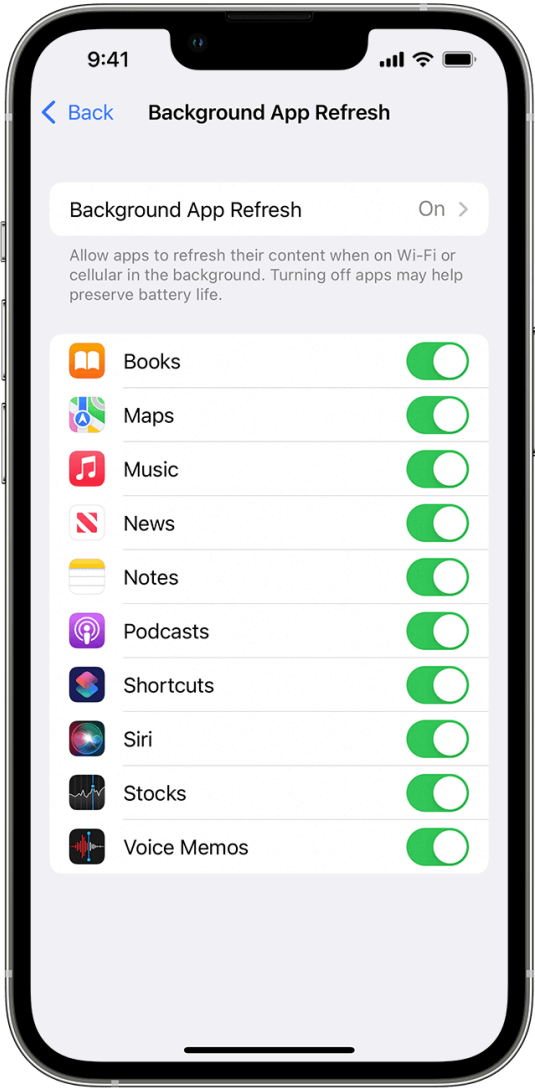
Claim	Public Documentation
	<p>; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/process-lifecycle; https://developer.android.com/guide/background; https://developer.android.com/about/versions/pie/android-9.0; https://developer.android.com/training/basics/network-ops/reading-network-state; https://developer.android.com/training/connectivity/network-access-optimization; https://developer.android.com/reference/android/net/NetworkCapabilities. <i>see also</i> the exemplary screenshots below:</p>







Claim	Public Documentation
	<p>See also, e.g., https://www.verizon.com/support/knowledge-base-207174/:</p> <div><div><div>Personal Business</div><div>Stores Español</div></div><div><div></div><div>Shop Why Verizon Support</div><div>Sign in  Search </div></div><div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div></div> <p>Support > Apple > Apple iPhone 7 Plus</p> <h2>Apple iPhone - Turn Background App Refresh On / Off</h2> <div>NOTE When Background App Refresh is turned on, apps that take advantage of this feature can refresh themselves in the background. For additional info, refer to multitasking and background app refresh.</div> <ol style="list-style-type: none">1. From a Home screen on your Settings  General. → If an app isn't available on your Home screen, swipe left to access the App Library.2. Tap Background App Refresh twice then tap one of the following: → When low power mode is on, the background app refresh is disabled.<ul style="list-style-type: none">• Off• Wi-Fi• Wi-Fi and Cellular Data <p>https://support.apple.com/en-us/HT202070:</p>

Claim	Public Documentation
	<div data-bbox="606 305 1297 363"><h2>Use Background App Refresh</h2></div> <div data-bbox="606 391 1377 638"><p>After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content.</p></div> <div data-bbox="606 672 1373 878"><p>If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again.</p></div> <div data-bbox="588 1377 1144 1412"><p>https://support.apple.com/en-us/HT205234:</p></div> <div data-bbox="1436 261 1967 1343"></div>

Use Low Power Mode to save battery life on your iPhone or iPad


Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

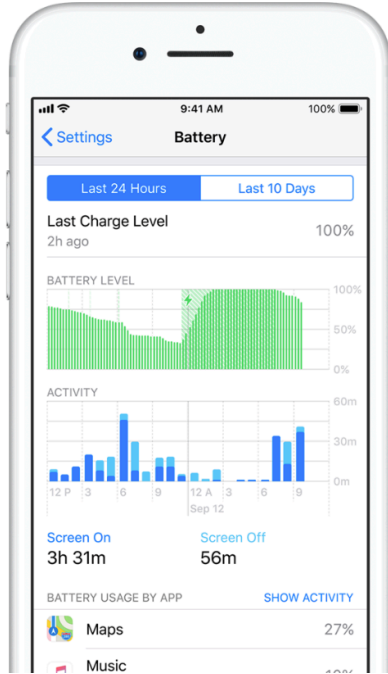
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models¹
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display²
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon  and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

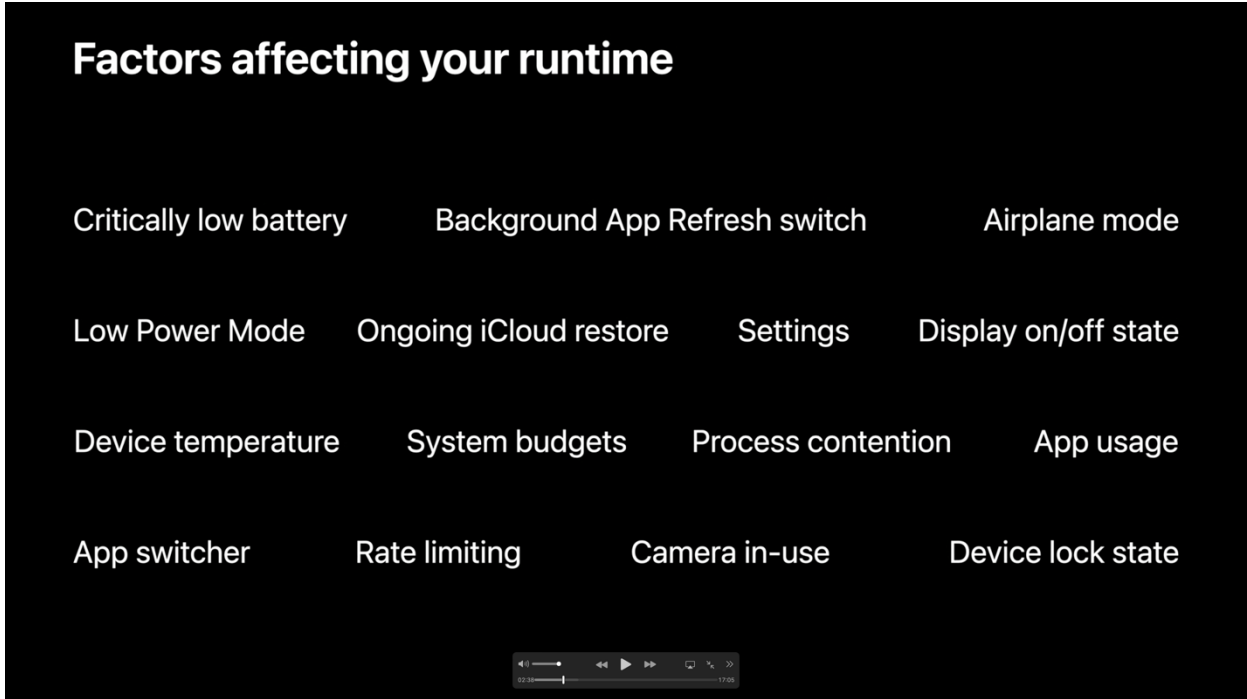











1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).


2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	<p>https://www.apple.com/batteries/maximizing-performance/:</p> <h2 data-bbox="625 305 1396 358">View Battery Usage information</h2> <p data-bbox="625 378 1316 500">With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.</p> <p data-bbox="625 527 1293 584">Here are the messages you may see listed below the apps you've been using:</p> <p data-bbox="625 656 1293 745">Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.</p> <ul data-bbox="657 777 1316 1024" style="list-style-type: none"> • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  <p data-bbox="583 1068 1990 1393">; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/;</p>

Claim	Public Documentation
	<p>https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063/;</p>

Claim	Public Documentation
	 <p>The screenshot shows a video player interface with a black background and white text. The title 'Factors affecting your runtime' is at the top. Below it, a grid of factors is displayed:</p> <ul style="list-style-type: none">Critically low batteryBackground App Refresh switchAirplane modeLow Power ModeOngoing iCloud restoreSettingsDisplay on/off stateDevice temperatureSystem budgetsProcess contentionApp usageApp switcherRate limitingCamera in-useDevice lock state <p>A video progress bar is visible at the bottom of the screenshot, showing a duration of 02:18.</p>

Claim	Public Documentation
	<div data-bbox="583 240 1822 932"><h3 data-bbox="653 272 877 321">Top factors</h3><div data-bbox="680 435 1249 862"><div data-bbox="680 435 1092 467"> Critically low battery</div><div data-bbox="680 500 1050 532"> Low Power Mode</div><div data-bbox="680 565 961 605"> App usage</div><div data-bbox="680 638 995 670"> App switcher</div><div data-bbox="680 703 1249 735"> Background App Refresh switch</div><div data-bbox="680 768 1039 800"> System budgets</div><div data-bbox="680 833 982 865"> Rate limiting</div></div><div data-bbox="1619 651 1782 894"></div><div data-bbox="1089 889 1316 922"></div></div>








Claim	Public Documentation
	 <p>; see also, e.g., https://www.verizon.com/plans/; https://www.verizon.com/business/products/plans/; https://www.verizon.com/business/products/security/mobile-device-endpoint-security/mobile-device-management/mdm-device-enrollment-programs/; https://www.verizon.com/solutions-and-services/add-ons/safety/verizon-smart-family/; https://www.verizon.com/support/knowledge-base-206963/; https://www.verizon.com/support/knowledge-base-152696/; https://www.verizon.com/support/verizon-smart-family-faqs/.</p>
<p>2. The wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively deny one or more Internet service activities by or on behalf of the particular application when the particular application is one of the</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively deny one or more Internet service activities by or on behalf of the particular application when the particular application is one of the first one or more applications, the classified wireless network is a WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground.”</p> <p>See, for example, the disclosures identified for claim 1.</p>




Claim	Public Documentation
first one or more applications, the classified wireless network is a WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground.	
3. The wireless end-user device of claim 2, wherein the one or more processors are further configured to override the selective denial of one or more Internet service activities by or on behalf of the particular application when the user has augmented the differential traffic control policy so as to indicate that Internet service activities are allowable when the classified wireless network is the WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground.	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 2, wherein the one or more processors are further configured to override the selective denial of one or more Internet service activities by or on behalf of the particular application when the user has augmented the differential traffic control policy so as to indicate that Internet service activities are allowable when the classified wireless network is the WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground.”</p> <p><i>See, for example, the disclosures identified for claims 1-2.</i></p>
4. The wireless end-user device of claim 2, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of the particular application when the particular application is one of the first one or more applications, the	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 2, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of the particular application when the particular application is one of the first one or more applications, the classified wireless network is the WWAN type, and the particular application is classified as interacting with the user in the device user interface foreground.”</p> <p><i>See, for example, the disclosures identified for claims 1-2.</i></p>


Claim	Public Documentation
classified wireless network is the WWAN type, and the particular application is classified as interacting with the user in the device user interface foreground.	
5. The wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of a second particular application and/or service when the second particular application and/or service is one of the second one or more applications and/or services and the classified wireless network is the WWAN type.	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of a second particular application and/or service when the second particular application and/or service is one of the second one or more applications and/or services and the classified wireless network is the WWAN type.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
6. The wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground when the user of the device is directly interacting with that application or perceiving any benefit from that application.	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground when the user of the device is directly interacting with that application or perceiving any benefit from that application.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>

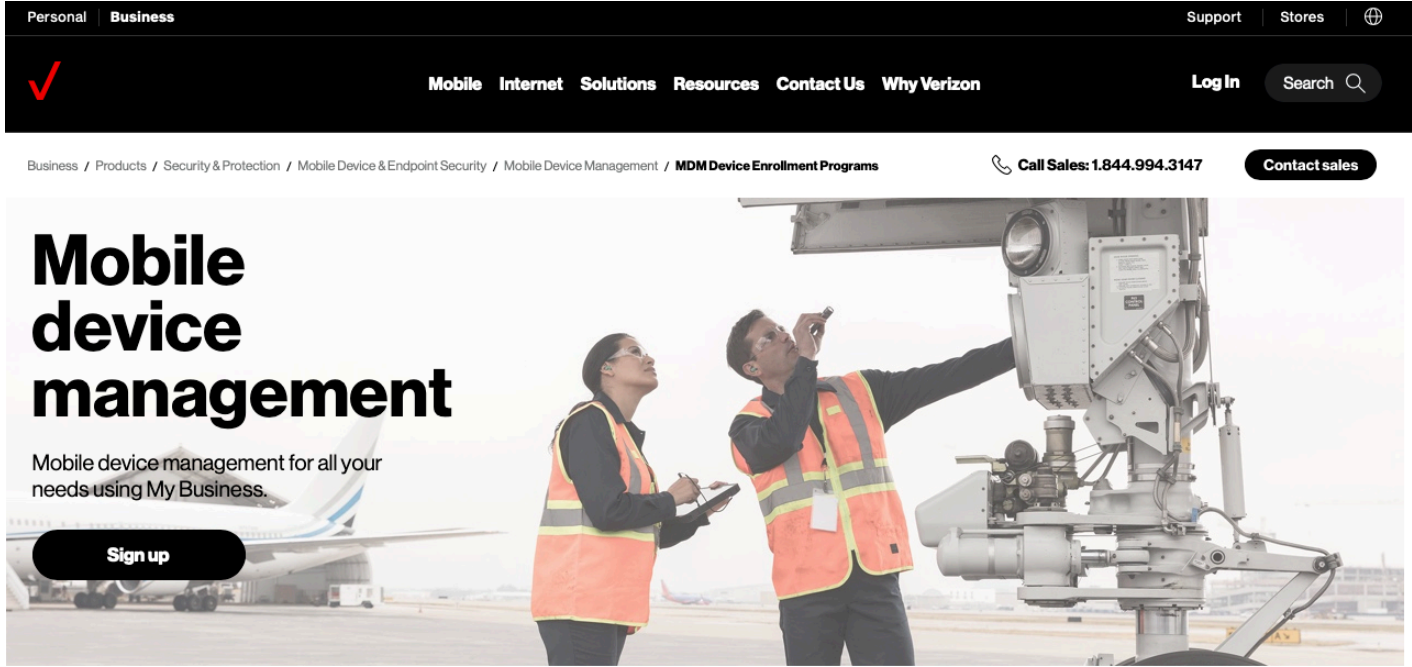
Claim	Public Documentation
<p>7. The wireless end-user device of claim 1, wherein the user interface is further to provide the user of the device with information regarding why the differential traffic control policy is applied to the particular application.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the user interface is further to provide the user of the device with information regarding why the differential traffic control policy is applied to the particular application.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>8. The wireless end-user device of claim 1, wherein the differential traffic control policy is part of a multimode profile having different policies for different ones of the network types.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the differential traffic control policy is part of a multimode profile having different policies for different ones of the network types.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>9. The wireless end-user device of claim 8, wherein the one or more processors are further configured to select a traffic control policy from the multimode profile based at least in part on the classified wireless network type.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 8, wherein the one or more processors are further configured to select a traffic control policy from the multimode profile based at least in part on the classified wireless network type.”</p> <p><i>See, for example, the disclosures identified for claims 1 and 8.</i></p>
<p>10. The wireless end-user device of claim 9, wherein the one or more processors are further configured to, when the classified wireless network type is at least one type of WLAN, select the traffic control policy from the multimode profile based at least in part on a type of network connection from the WLAN to the Internet.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 9, wherein the one or more processors are further configured to, when the classified wireless network type is at least one type of WLAN, select the traffic control policy from the multimode profile based at least in part on a type of network connection from the WLAN to the Internet.”</p> <p><i>See, for example, the disclosures identified for claim 1 and 9.</i></p>

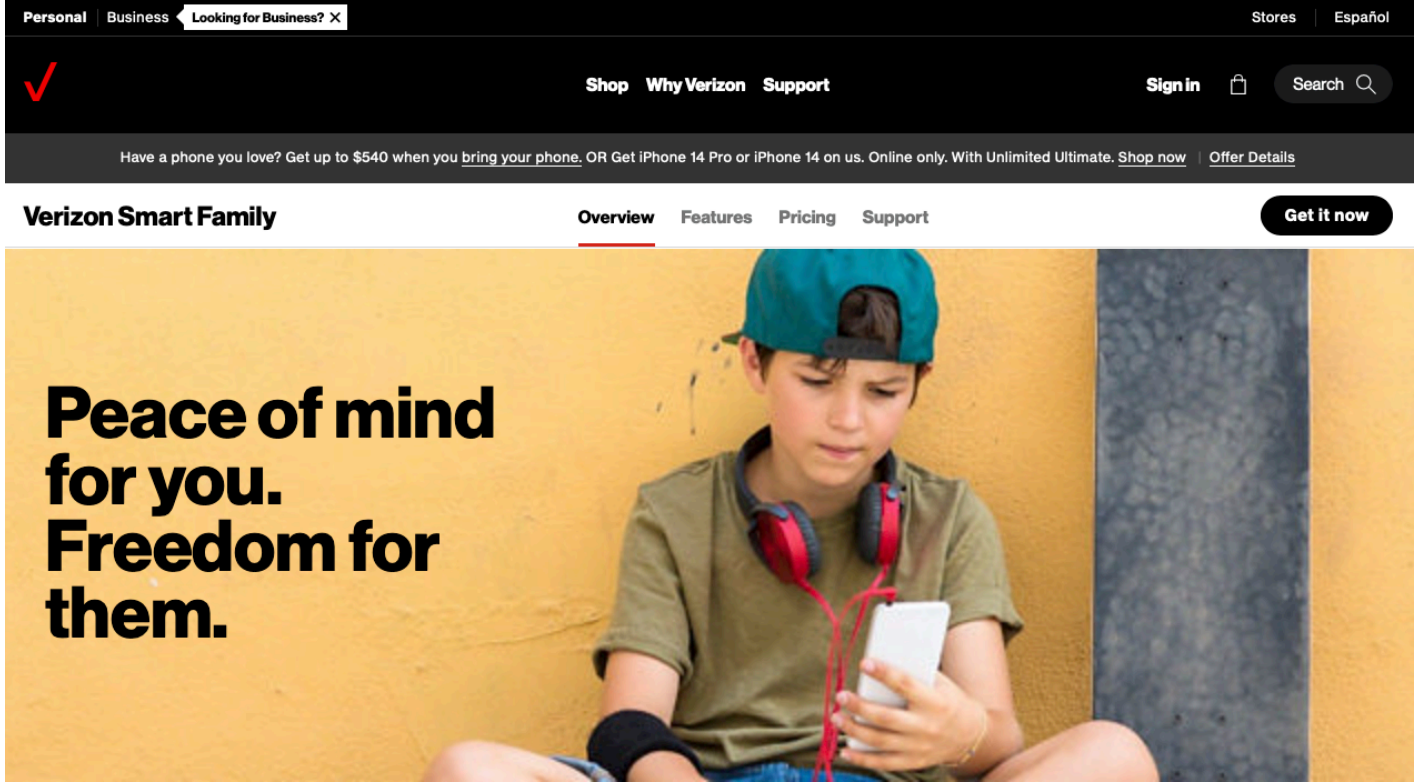
Claim	Public Documentation
<p>11. The wireless end-user device of claim 1, wherein the plurality of network types include three or more of 2G, 3G, 4G, home, roaming, and WiFi.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the plurality of network types include three or more of 2G, 3G, 4G, home, roaming, and WiFi.”</p> <p><i>See</i>, for example, the disclosures identified for claim 1.</p>
<p>12. The wireless end-user device of claim 1, the one or more processors further configured to receive an update to at least a portion of the differential traffic control policy list from a network element.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, the one or more processors further configured to receive an update to at least a portion of the differential traffic control policy list from a network element.”</p> <p><i>See</i>, for example, the disclosures identified for claim 1.</p> <p>As yet another example, the one or more processors are configured to receive portions of policies from a network element. <i>See, e.g.</i>, https://www.verizon.com/plans/:</p>






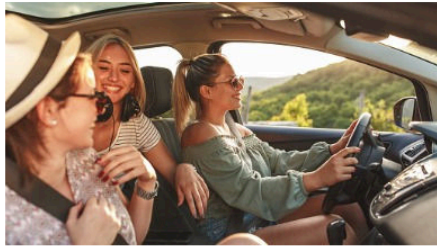
Claim	Public Documentation
	<div><div><div><div>PersonalBusiness</div><div>StoresEspañol</div></div><div><div></div><div>ShopWhy VerizonSupport</div><div>Sign inSearch</div></div><div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div></div><div><h2>Pick your perfect plan.</h2><p>Experience ultra-fast mobile and home internet plans. Plus, get special discounts to save you more.</p><div><h3>Mobile plans</h3><p>Get our best plans ever, with unlimited data on all your devices.</p><div><div><h4>Unlimited</h4><p>Get the power of 5G Ultra Wideband with unlimited data and 10x faster speeds.¹</p></div><div><h4>Prepaid</h4><p>Pay before you talk, text and stream. Now including Unlimited and 5G.</p></div><div><h4>Connected devices</h4><p>Get unlimited monthly data for devices such as mobile hotspots, tablets, laptops, smartwatches and more.</p></div><div><h4>International</h4><p>Whether you're traveling the world or at home in the US, Verizon helps you stay connected.</p></div></div><p>; https://www.verizon.com/business/products/plans/:</p></div></div></div>

Claim	Public Documentation
	<div><div><div>Personal Business</div><div>Support Stores </div><div> Mobile Internet Solutions Resources Contact Us Why Verizon</div><div>Log In Search </div></div><div>Business / Products / Plans Call Sales: 1.888.789.1223 Contact sales</div><div><h1>Plans for your business</h1><p>From mobile networks to internet connectivity and cybersecurity protection, we have plans to fit your business needs.</p></div><div>Mobile plans Fios internet plans Voice plans</div><div><h2>Business Unlimited Mobility Plans</h2><p>Our Business Unlimited plans provide mobility built for getting work done, with the 5G, data and performance your business needs.</p><div><div>View details <input type="checkbox"/> Off</div><div><div><h3>Business Unlimited Start 5G</h3><p>Get the essentials</p><p>As low as \$30/line ⓘ</p><p>Get started</p></div><div><h3>Business Unlimited Plus 5G</h3><p>Boost your productivity</p><p>As low as \$40/line ⓘ</p><p>Get started</p></div><div><h3>Business Unlimited Pro 5G</h3><p>Get more of what you need</p><p>As low as \$45/line ⓘ</p><p>Get started</p></div></div><p>; https://www.verizon.com/support/knowledge-base-212894/:</p></div></div></div> <div data-bbox="930 1487 1157 1526" data-label="Page-Footer"><p>Page 163 of 179</p></div>

Claim	Public Documentation
	<p data-bbox="604 272 953 297">Support > Apple > Apple iPhone 15</p> <h1 data-bbox="638 370 1661 513">Apple iPhone - Update Carrier Settings</h1> <div data-bbox="642 597 1948 1094"><p data-bbox="688 643 768 667">NOTE</p><ul data-bbox="730 708 1898 1024" style="list-style-type: none"><li data-bbox="730 708 1898 862">• Carrier settings updates are small files that are installed on iOS devices. The carrier settings include updates to Access Point Names (APNs), MMS settings, features like tethering and default apps. Having the most up to date carrier settings is recommended for the proper functionality of the device.<li data-bbox="730 911 1898 1024">• Apple® Watch® Series 3 users must be on Carrier Bundle 29.1 or higher (check on your iPhone® via Settings > General > About > Carrier). For more info on how to check carrier and / or update your Carrier version, refer to Updating Your Carrier Settings</div> <ol data-bbox="646 1159 1671 1395" style="list-style-type: none"><li data-bbox="646 1159 1671 1256">1. From a Home screen on your Settings  > General. → If unavailable, swipe left to access the App Library. → If a carrier settings update is available, you're presented with an option to update.<li data-bbox="646 1297 1352 1395">2. Tap About. → If an update is available, an option appears to update. → To view the current carrier info, refer to View Carrier.

Claim	Public Documentation
	<p data-bbox="583 245 1944 313">https://www.verizon.com/business/products/security/mobile-device-endpoint-security/mobile-device-management/mdm-device-enrollment-programs/:</p> <div data-bbox="583 349 1986 1011"></div> <p data-bbox="583 1027 1686 1060">https://www.verizon.com/solutions-and-services/add-ons/safety/verizon-smart-family:</p>

Claim	Public Documentation
	 <p>The screenshot displays the Verizon Smart Family website. At the top, there is a navigation bar with links for 'Personal', 'Business', and a 'Looking for Business?' button. To the right are links for 'Stores' and 'Español'. Below this is a dark header featuring the Verizon checkmark logo, navigation links for 'Shop', 'Why Verizon', and 'Support', and a 'Sign in' button with a shopping bag icon and a search bar. A promotional banner below the header reads: 'Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details'. The main content area is titled 'Verizon Smart Family' with sub-links for 'Overview', 'Features', 'Pricing', and 'Support', and a 'Get it now' button. The primary visual is a large image of a young boy wearing a teal cap and headphones, sitting on the floor and looking at a white smartphone. Overlaid on the left side of this image is the text: 'Peace of mind for you. Freedom for them.'</p>

Claim	Public Documentation
	<div data-bbox="594 253 1026 496"></div> <div data-bbox="594 529 783 565">Block it Out</div> <div data-bbox="594 581 1026 630"><p>Keep certain apps and sites blocked until your kid is ready.</p></div> <div data-bbox="1068 253 1501 496"></div> <div data-bbox="1068 529 1419 565">Trusted contacts only</div> <div data-bbox="1068 581 1501 695"><p>Make sure they're only texting and chatting with contacts you've approved. Learn more about setting Trusted Contacts by visiting: https://www.verizon.com/support/how-to-use-verizon-smart-family/.</p></div> <div data-bbox="1543 253 1976 496"></div> <div data-bbox="1543 529 1885 565">Cut back screen time</div> <div data-bbox="1543 581 1976 649"><p>Turn off the web during school hours, bedtime or dinner time so they can focus on what matters most.</p></div> <div data-bbox="594 781 1026 1024"></div> <div data-bbox="594 1057 932 1092">Know where they are</div> <div data-bbox="594 1109 1026 1177"><p>Location tracking keeps tabs on your child's phone and sends alerts when they arrive at their destination.</p></div> <div data-bbox="1068 781 1501 1024"></div> <div data-bbox="1068 1057 1247 1092">Pick me up</div> <div data-bbox="1068 1109 1501 1157"><p>Kids can request and share location with their parents.</p></div> <div data-bbox="1543 781 1976 1024"></div> <div data-bbox="1543 1057 1864 1130">View their driving or passenger activity</div> <div data-bbox="1543 1146 1976 1195"><p>Keep your mind at ease whether your kids are on the bus, carpooling or driving.</p></div> <div data-bbox="594 1219 1976 1287"><p>; https://www.verizon.com/support/knowledge-base-206963/; https://www.verizon.com/support/knowledge-base-152696/; https://www.verizon.com/support/verizon-smart-family-faqs/:</p></div>

What Verizon Smart Family features are available without downloading the Verizon Smart Family Companion app on my child's device?

Certain features are only available if the [Verizon Smart Family Companion app](#) is installed on your child's smartphone and paired with the Verizon Smart Family app on your device.

- **Without pairing, you can:**

- View call and text activity
- Set time restrictions on texts, calls and data usage*
- Set data limits*
- Set text, call and purchase limits
- Get access to the device's network location




Note: Network location accuracy may vary up to a few miles.

- **You must pair to:**

- Set content filters
- Monitor web and app activity
- Pause internet access
- Set time restrictions on Wi-Fi usage
- Locate family members and set location alerts with the best location accuracy
- Use the location check-in feature, where family members can send you their precise location when they arrive at their destination
- Use the **Pick Me Up** feature that lets your child send a request for a ride to a parent line

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Claim	Public Documentation
	<p>; https://developer.android.com/about/versions/pie/android-9.0:</p> <h3 data-bbox="600 289 1272 331">Data cost sensitivity in JobScheduler</h3> <p data-bbox="600 363 1934 428">Beginning in Android 9, <code>JobScheduler</code> can use network status signals provided by carriers to improve the handling of network-related jobs.</p> <p data-bbox="600 461 1787 493">Jobs can declare their estimated data size, signal prefetching, and specify detailed network requirements.</p> <p data-bbox="600 500 1934 607"><code>JobScheduler</code> then manages work according to the network status. For example, when the network signals that it is congested, <code>JobScheduler</code> might defer large network requests. When on an unmetered network, <code>JobScheduler</code> can run prefetch jobs to improve the user experience, such as by prefetching headlines.</p> <p data-bbox="600 639 1950 779">When adding jobs, make sure to use <code>setEstimatedNetworkBytes()</code>, <code>setPrefetch()</code>, and <code>setRequiredNetwork()</code> when appropriate to help <code>JobScheduler</code> handle the work properly. When your job executes, be sure to use the <code>Network</code> object returned by <code>JobParameters.getNetwork()</code>. Otherwise you'll implicitly use the device's default network which may not meet your requirements, causing unintended data usage.</p> <p>; https://developer.android.com/training/basics/network-ops/reading-network-state; https://developer.android.com/training/connectivity/network-access-optimization; https://developer.android.com/reference/android/net/NetworkCapabilities.</p>
<p>13. The wireless end-user device of claim 1, wherein the plurality of network types include a roaming WWAN type and a home WWAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the roaming WWAN type and the home WWAN type.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the plurality of network types include a roaming WWAN type and a home WWAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the roaming WWAN type and the home WWAN type.”</p> <p><i>See</i>, for example, the disclosures identified for claim 1.</p> <p>For further example, the policy can be based on roaming on a WWAN network. <i>See, e.g.</i>, https://www.verizon.com/plans/international/international-travel/</p>

Claim	Public Documentation
	<div><div><div><div><div>Personal</div><div>Business</div><div>Looking for Business? X</div></div><div>Stores</div><div>Español</div></div><div><div></div><div>Shop Why Verizon Support</div><div>Sign In  <input type="text" value="Search"/></div></div><div><div>Have a phone you love? Get up to \$540 when you bring your phone. OR Get iPhone 14 Pro or iPhone 14 on us. Online only. With Unlimited Ultimate. Shop now Offer Details</div><div><div><div><h1>Stay connected wherever you are.</h1><p>Verizon keeps you connected with coverage in more than 220 countries and destinations.</p>Plan your trip</div></div><div><div><div><div><h2>TravelPass</h2><p>Bring your unlimited data, talk and text to 210+ countries & destinations.</p>></div><div><h2>International Monthly Plan</h2><p>Get unlimited data, texts and a bundle of minutes for longer trips.</p>></div><div><h2>Mexico & Canada</h2><p>Roaming in Mexico and Canada is included in all Unlimited Plans.</p>></div><div><h2>Cruise and InFlight plans and rates</h2><p>View our data plan and pay as you go rates for voice and text.</p>></div></div><div>https://www.verizon.com/support/international-travel-faqs/#ready-outside-us</div></div></div></div></div></div></div>


How do I get my device ready to use outside the US?

Before you travel internationally, make sure your device's roaming is turned on so your device can connect to cellular networks in your destination country.

To turn on roaming, start on your device's home screen:

Device	Steps
iPhone®	1. Tap Settings (the gear icon).
	2. Tap Cellular , then tap Cellular Data Options , then Roaming .
	3. Slide both the Voice Roaming and the Data Roaming selectors to Green (on).
	4. Slide the International CDMA selector to off.
Motorola	1. Go to your Apps and tap Settings (the gear icon).
	2. Tap Network & Internet , then Mobile Network , then Data Roaming .
	3. Slide the Data Roaming selector to the right until it turns green.
	4. "Allow data roaming?" appears. Choose OK .
	5. Tap Preferred network type , then tap Global .
Android™	1. Go to your Apps, tap Settings , then tap More .
	2. Tap Mobile Networks and then Data Roaming access .
	3. Tap Allow access for all trips and Set Network Mode to Global .

Claim	Public Documentation
<p>14. The wireless end-user device of claim 1, wherein the plurality of network types include the WWAN type and a WLAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the WWAN type and the WLAN type.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the plurality of network types include the WWAN type and a WLAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the WWAN type and the WLAN type.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>15. The wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a power state of the device.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a power state of the device.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>16. The wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a device usage state.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a device usage state.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>17. The wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the applica-</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on power control state changes for one or more of the modems.”</p>

Claim	Public Documentation
<p>tion of the differential traffic control policy based on power control state changes for one or more of the modems.</p>	<p><i>See</i>, for example, the disclosures identified for claim 1.</p> <p>As a further example, the one or more processors change policies based on power control state changes of modems. <i>See, e.g.</i>, https://developer.android.com/training/connectivity/network-access-optimization.</p> <div data-bbox="594 393 1829 745"><h3 data-bbox="615 415 1281 472">Optimize network access </h3><p data-bbox="615 518 1812 610">Using the wireless radio to transfer data is potentially one of your app's most significant sources of battery drain. To minimize the battery drain associated with network activity, it's critical that you understand how your connectivity model will affect the underlying radio hardware.</p><p data-bbox="615 643 1801 735">This section introduces the wireless radio state machine and explains how your app's connectivity model interacts with it. It then offers several techniques which, when followed, will help minimize the effect of your app's data consumption on the battery.</p></div>

The radio state machine

The wireless radio on your user's device has built-in power-saving features that help minimize the amount of battery power it consumes. When fully active, the wireless radio consumes significant power, but when inactive or in standby, the radio consumes very little power.

One important factor to remember is that the radio cannot move from standby to fully active instantaneously. There is a latency period associated with "powering up" the radio. So the battery transitions from higher energy states to lower energy states slowly in order to conserve power when not in use while attempting to minimize the latency associated with "powering up" the radio.

The state machine for a typical 3G network radio consists of three energy states:

- **Full power:** Used when a connection is active, allowing the device to transfer data at its highest possible rate.
- **Low power:** An intermediate state that cuts battery power consumption by around 50%.
- **Standby:** The minimal power-consuming state during which no network connection is active.

While the low and standby states drain significantly less battery, they also introduce significant latency to network requests. Returning to full power from the low state takes around 1.5 seconds, and moving from standby to full power can take over 2 seconds.

To minimize latency, the state machine uses a delay to postpone the transition to lower energy states. Figure 1 uses AT&T's timings for a typical 3G radio.

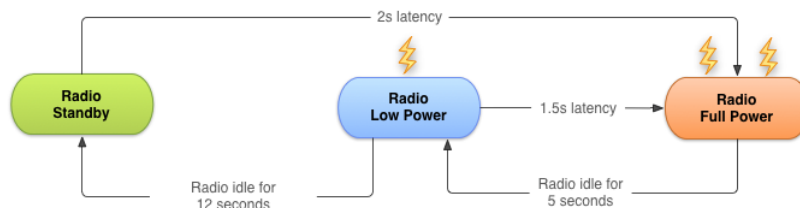


Figure 1. Typical 3G wireless radio state machine.

The radio state machine on each device, particularly the associated transition delay ("tail time") and startup latency, will vary based on the wireless radio technology employed (3G, LTE, 5G, and so on) and is defined and configured by the carrier network over which the device is operating.

This page describes a representative state machine for a typical 3G wireless radio, based on data provided by AT&T. However, the general principles and resulting best practices are applicable for all wireless radio implementations.

This approach is particularly effective for typical mobile web browsing as it prevents unwelcome latency while users browse the web. The relatively low tail-time also ensures that once a browsing session has finished, the radio can move to a lower energy state.

Unfortunately, this approach can lead to inefficient apps on modern smartphone operating systems like Android, where apps run both in the foreground (where latency is important) and in the background (where battery life should be prioritized).

How apps impact the radio state machine

Every time you create a new network connection, the radio transitions to the full power state. In the case of the typical 3G radio state machine described earlier, it will remain at full power for the duration of your transfer—plus an additional 5 seconds of tail time—followed by 12 seconds at the low energy state. So for a typical 3G device, every data transfer session will cause the radio to draw energy for at least 18 seconds.

In practice, this means that an app which makes a one second data transfer, three times a minute, will keep the wireless radio perpetually active, moving it back to high power just as it is entering standby mode.

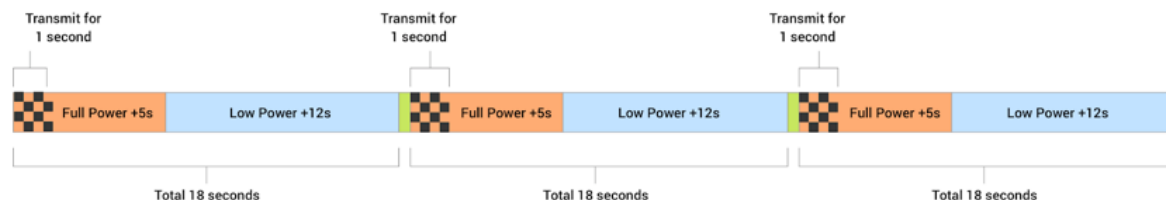


Figure 2. Relative wireless radio power use for one-second transfer running three times every minute. Figure excludes “power up” latency between runs.

By comparison, if the same app bundled its data transfers, running a single three-second transfer every minute, this would keep the radio in the high-power state for a total of only 20 seconds each minute. This would allow the radio to be on standby for 40 seconds of every minute, resulting in a significant reduction in battery consumption.

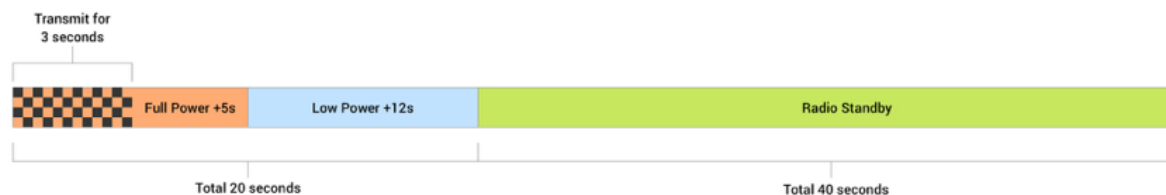


Figure 3. Relative wireless radio power use for three second transfers running once every minute.

Optimization techniques

Now that you understand how network access affects battery life, let's talk about a few things that you can do to help reduce battery drain, while also providing a fast and fluid user experience.

Bundle data transfers

As stated in the previous section, bundling your data transfers so that you're transferring more data less often is one of the best ways to improve battery efficiency.

Of course, this is not always possible to do if your app needs to receive or send data immediately in response to a user action. You can mitigate this by anticipating and [prefetching data](#). Other scenarios, such as sending logs or analytics to a server and other, non-urgent, app-initiated data transfers, lend themselves very well to batching and bundling. See [Optimizing app-initiated tasks](#) for tips on scheduling background network transfers.

Prefetch data

Prefetching data is another effective way to reduce the number of independent data transfer sessions that your app runs. With prefetching, when the user performs an action in your app, the app anticipates which data will most likely be needed for the next series of user actions and fetches that data in a single burst, over a single connection, at full capacity.

By front-loading your transfers, you reduce the number of radio activations required to download the data. As a result, you not only conserve battery life, but also improve the latency, lower the required bandwidth, and reduce download times.

Prefetching also provides an improved user experience by minimizing in-app latency caused by waiting for downloads to complete before performing an action or viewing data.

Claim	Public Documentation
	<div data-bbox="594 245 1829 802" style="border: 1px solid black; padding: 10px;"> <p>Check for connectivity before making requests</p> <p>Searching for a cell signal is one of the most power-draining operations on a mobile device. A best practice for user-initiated requests is to first check for a connection using <code>ConnectivityManager</code>, as shown in Monitor connectivity status and connection metering. If there's no network, the app can save battery by not forcing the mobile radio to search. The request can then be scheduled and performed in a batch with other requests when a connection is made.</p> <p>Pool connections</p> <p>An additional strategy that can help in addition to batching and prefetching, is to pool your app's network connections.</p> <p>It's generally more efficient to reuse existing network connections than it is to initiate new ones. Reusing connections also allows the network to more-intelligently react to congestion and related network data issues.</p> <p><code>HttpURLConnection</code> and most HTTP clients, such as OkHttp, enable connection-pooling by default, and reusing the same connection for multiple requests.</p> </div>
<p>18. The wireless end-user device of claim 1, wherein the differential traffic control policy defines that the first one or more applications can only access a first one of the network types during particular time windows.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the differential traffic control policy defines that the first one or more applications can only access a first one of the network types during particular time windows.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>19. The wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground based on a state of user interface priority for the application.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground based on a state of user interface priority for the application.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>

Claim	Public Documentation
<p>20. The wireless end-user device of claim 1, wherein the second one or more applications are not subject to a differential network access control that is applicable to the first one or more applications.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the second one or more applications are not subject to a differential network access control that is applicable to the first one or more applications.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>21. The wireless end-user device of claim 1, wherein the one or more processors are further configured to classify between: user applications; system applications, utilities, functions, or processes; and operating system application, utilities, functions, or processes.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to classify between: user applications; system applications, utilities, functions, or processes; and operating system application, utilities, functions, or processes.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>22. The wireless end-user device of claim 1, wherein the second one or more applications or services comprises foreground services.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the second one or more applications or services comprises foreground services.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>23. The wireless end-user device of claim 1, wherein selectively deny comprises intermittently block when the one or more Internet service activities are requested during selected time windows.</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein selectively deny comprises intermittently block when the one or more Internet service activities are requested during selected time windows.”</p> <p><i>See, for example, the disclosures identified for claim 1.</i></p>
<p>24. The wireless end-user device of claim 1, wherein the one or more processors are configured to pre-</p>	<p>The Accused Instrumentalities comprise “[t]he wireless end-user device of claim 1, wherein the one or more processors are configured to prevent the first one or more applications from changing the power state of at least one of the modems, and to not prevent the second one or more applications from changing the power state of the same modem or modems.”</p>

Claim	Public Documentation
vent the first one or more applications from changing the power state of at least one of the modems, and to not prevent the second one or more applications from changing the power state of the same modem or modems.	<i>See</i> , for example, the disclosures identified for claims 1 and 17.